

WORLD BANK

The Prospects and Constraints of Development of Gum Arabic in Sub-Saharan Africa

A document based on the available literature and field trips to Chad, Mali and Niger

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Introduction

Gum arabic, and the acacia trees from which this gum is tapped, are an integral part of life in the Sahelian countries of Africa. Whether as nomadic collectors, sedentary small scale producers, rural merchants or exporters from the capital, several hundreds of thousands of people depend directly or indirectly on the production of gum arabic for providing at least part of their subsistence.

The objective of this paper is to contribute to a reflection currently underway at the World Bank (Africa Tree Crops Initiative) which aims at helping the producer countries to develop an improved strategy of assistance to this sector, on the basis of improved knowledge concerning all aspects determining its production and the markets that are supplied with gum arabic, and on the future prospects currently affecting these markets.

This paper was written using documentary material from various different sources, in particular the FAO, the AFD, the ITC, the UE as well as several other private sources. This documentary study was followed up by country missions to Chad, Mali and Niger during the month of October 2002. Despite the difficult conditions, the mission visited several gum producing villages and talked with the producers. We would like to take this opportunity of thanking Mr Boukari Doudou (Chad), Mr Mamadou Gueye (Mali) Mr Boubacar Wankoye and Mr Boureima Wankoye (Niger) for their most valuable assistance during their visit to these countries.

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1. Definition of gum arabic

The term “gum arabic” is used with varying degrees of precision by different groups of people. In the context of its use as a food additive, almost all the different consumer countries define gum arabic as “the gummy exudation of *Acacia senegal*(L) Willdenow¹ or closely related species”. This definition has been hotly contested over the years by various consuming and producing countries, Sudan for instance, who have sought to restrict the definition of gum arabic strictly to the product of the *Acacia senegal* in order to maintain their control over the market.

The most recent specification of gum arabic was drawn up at the March 1999 meeting of the Codex Committee on Food Additives and Contaminants. This specification defines gum arabic as “the dried exudate from the trunk and branches of *Acacia senegal* or *Acacia seyal*, of the family Leguminosae”. Hence to-day, the term “gum arabic” includes two different types of gum which are produced and marketed in significant quantities : one, the hard gum, known as “hashab” in Sudan or “kitir” in Chad, or “first quality” in Mali and which has as its origin the gum exuded from the *Acacia senegal*. The other, known in Sudan and Chad as “talha” and “second quality” in Mali is a flaky or crumbly variety, which originates from another type of acacia tree, the *Acacia seyal*². At present, the world market is divided more or less half and half between these two type of gum arabic. Gum from the *Acacia seyal* has made its appearance more recently on the world market whereas trade in the hard gum from *Acacia senegal* dates from far earlier times.

The two types of tree are relatively easily distinguishable, but the gum nodules of the freshly picked gum are difficult to separate. When the gum dries out, the two types again become easily distinguishable, the *Acacia seyal* gum becomes flaky and is reduced into a granulated form, whereas the hard gum of the *Acacia senegal* retains its form as hardened lumps or nodules, in which form it can be exported³.

2. *Acacia senegal* and *Acacia seyal*

2.1. Two different species

The *Acacia senegal* species has a wide distribution and remarkable adaptability. It is essentially a semi-arid zone species, but it is both drought and frost resistant and can grow with a rainfall of between 100 and 800 mm per year. It grows across Africa, from Senegal to Ethiopia, through Mali, Nigeria, Chad and Sudan, to mention only the major producing areas. It is also found in the Middle East, Yemen, India and Pakistan. To be able to get gum from this tree, it has to be tapped about 3-6 weeks in advance of collection. In the Sudan, particularly in the Kordofan and Darfour provinces, the species is uniform and found in pure stands giving the Sudan an important advantage of being the most important producer of this type of gum arabic. In other producing countries, *Acacia Senegal* is often found mixed with other species. Another feature of the Sudan system of production is that this species occurs both as a wild and as a cultivated species - it is often replanted by man in village plantations, for example, in this country.

¹ In this text, the species *Acacia senegal* refers to the exact species *Acacia senegal – variety senegal*. The other varieties of *Acacia senegal* (*var. kerensis* and *leiorhachis*) have a much more restricted distribution than *var. senegal* and provide only very tiny amounts of gum to the market.

² Precisely, the *Acacia seyal var. seyal*

³ Strictly speaking, *Acacia senegal* hard gum should have an optical deviation of between -25° and -35° , a Ph between 4.1 and 4.8, a viscosity less than 140 CPS and an insoluble content of less than 3%. *Acacia seyal* flaky gum should have an optical deviation of between $+45^{\circ}$ and $+55^{\circ}$, a Ph of between 4.1 and 4.8, a viscosity below 70 Cps.

The *Acacia seyal* on the other hand grows and regenerates naturally, it does not require tapping and exudes its gum naturally. It grows in the Sudano-Sahelian belt where the rainfall is slightly higher than in the regions populated with the *Acacia senegal*. Its bio-mass has been calculated to be 50 times greater than that of the *Acacia Senegal* which gives it an important advantage in terms of production potential. It is affected at a later stage than the *Acacia Senegal* by the desertification process. It can grow on clay soils and resists well to climatic changes from temporary wet to prolonged dry periods with a consequent cracking of the surface of the soil.

Whilst the *Acacia senegal* and the *Acacia seyal* are present together in the same geographical zone, they have their own biotope (for example, nearer to water for the *Acacia seyal*, drier areas for the *Acacia senegal*).

2.2. The gum belt

The gum belt refers to a broad band, situated at a latitude of between 12° and 16° North, stretching across sub-Saharan Africa, from Mauritania in the West, through Senegal and Mali, Burkina Faso, Niger, Northern Nigeria to Sudan, Eritrea, Ethiopia, Kenya, Somalia and Northern Uganda in the East. Most of these countries appear in the statistics as sources of gum arabic, although they differ greatly in terms of the quantities involved. We can assume that they all have a comparative advantage in the production of gum arabic on account of the natural conditions that prevail and the presence of *Acacia senegal* or *Acacia seyal* on their soil.

3. Grades and qualities of gum arabic sold on the world market

The Sudan has established a very detailed classification for its hard variety of gum arabic and this has become the reference on the world market. This classification known as Kordofan, takes its name from the main producing area in the country. Kordofan is a hard variety of gum that comes from the *Acacia senegal*.

3.1. Kordofan classification of gum arabic

Denomination	Description	% at sorting
Clean Amber Sort – CAS	Whole nodule, clear, Ø >30 mm	0 to 5%
Hand Picked Selected - HPS	Whole nodule, Ø >20 mm	5-10%
Cleaned	Whole nodules plus fragments, 10 <Ø <20 mm	70%
Siftings	Fragments and siftings, 2.5<Ø < 10 mm	5%
Dust	Ø < 2.5 mm	5%
Red gum	Rejects – local use only	

The main public Sudanese export company, the Gum Arabic Company, also markets flaky gum called “talha”. This type of gum is simply cleaned; there is no calibration involved in its production. Since 1995, it is sorted into three grades : super, standard clean and siftings.

3.2. Nigerian grades

According to Gavens (1999) Nigeria markets its gums with only two different denominations, Nigeria Grade 1 and Grade 2, as follows:

Nigerian grades

Denomination	Correspondence with Sudanese classification	Description
Nigeria Grade 1	HPS and Cleaned	Clean whole nodules

Nigeria Grande 2	Siftings and/or talha Dust and red gum	Fragments/fine siftings Dark fragments mixed with other types of gum
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Certain importers prefer the Kordofan Cleaned or HPS to the Nigerian N° 1. Nigerian Grade N° 2 is a mixed gum, flaky and hard, and is generally considered as of the flaky sort.

However, more recently, a Workshop on Gum Arabic in Nigeria ⁴, has established that a more detailed set of grades exists. This is :

- Grade 1 – large nodules of Acacia Senegal gum
- Grade 2 S- large nodules of Acacia Seyal and mixed gum with an OR⁵ of -5° to +5°
- Grade 2 – smaller nodules of both types of gum, OR +20° to +60°
- Grade 3 – dust, siftings OR -40° to -60°, plus blends with combretum

Sorting of the different grades occurs at point of origin because the different grades fetch different prices, but is not done again until the gum reaches the exporters warehouse – at this point most of the gum is found to be adulterated, according to the ARD Workshop. Because Grade 1 gum is in short supply and almost identical in appearance to Grade 2S, it is not unusual to find the two grades mixed at the level of the regional markets where gum arabic is aggregated before being sold on to the exporters.

3.3. Chadian grades

Chad markets both types of gum, kitir and talha. These two types are not mixed at the time of preparation for export and are sold under their separate denominations. The following table gives the grades of Chadian kitir and its correspondence with the Sudanese Kordofan classification.

Kitir Grades - Chad

Denomination	Correspondence Sudanese classification	Description
Kitir HPS	HPS	Whole nodule, Ø > 20mm
Kitir N°1	Cleaned	Clean and sifted
Grabeaux	Sifting	Fragments 2.5 < Ø < 10mm
Poussière	Dust	Not exported in general
Rejects		Not exported

Little by little, the Chadian classification has become accepted by the international trading community and is now accepted as being in general the equivalent of the Kordofan classification.

Talha gum is often called “second quality gum” in comparison to kitir. This is regrettable since the two types of gum are not directly comparable, or at least both can be of the best quality. The Chadian flaky gum, of a lighter more yellowish colour than that produced by the Sudan, is particularly sought after by certain importers who take it as a reference. The talha is cleaned and very roughly sorted; it is rarely mixed with other types of gum.

4. Production and world exports of gum arabic

4.1. World exports

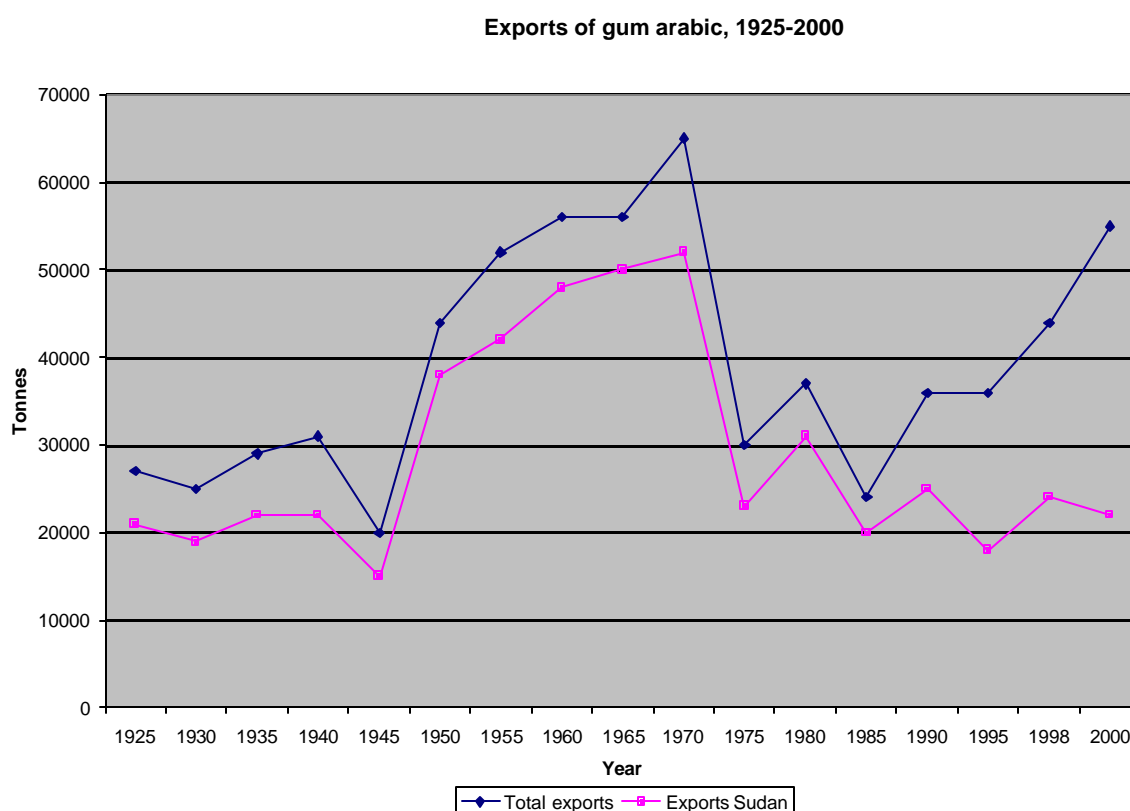
⁴ Organised by the Consultancy Company ARD and financed by the USAID in May 2002

⁵ Optical rotation

There are no official statistics on the production or exports of gum arabic currently available. Reliance has to be made on customs statistics, different experts' reports and partial statistics, available in reports that have been produced on a limited scale for different organisations in the past. Some information is provided by Muller (2000), Gavens (1999), CNI (undated) and the Consulting Company, ARD, which is working on the gum arabic sector in Nigeria.

There are in particular no reliable statistics available for the production of gum arabic. However, since this production is almost entirely exported (there is a very small amount of local use for the treatment of clothing) then the export figures are a good proxy for the level of production in the different countries.

The following graph gives an idea of total exports on the world market since 1925 and the share of the major exporter, Sudan, in these exports. These data are taken from Gavens (1999) and CNI (undated).



As can be seen, from 1925 till the end of the 1960s, exports increased constantly to a level of around 60.000 tonnes, interrupted only during the period of the second world war. The first oil crisis at the beginning of the 1970s and its consequences on the level of consumption had an initial impact on exports of gum arabic, but the major decline in recorded exports was due to the prolonged drought that affected Africa during the period 1968-1972 and again in 1982-1986. These years mark a turning point in the consumption of gum arabic with the level of exports declining to around 25.000 tonnes.

Due in many cases to a degree of speculation by European importers/processors, in 1986, the kilo of hashab gum was worth between 5 and 6\$US, and after processing, it cost in the region of 10\$US/kg. As a result, many importers sought alternative sources of supply and many clients turned to manufactured substitutes, mainly modified starches for use in their food industry applications.. Despite the improvement in climatic conditions, the level of exports during the early to mid 1990s did not

recover beyond 35.000 tonnes. In the last five years, the level of exports has increased again To a level of around 50.000 tonnes, but this increase is due almost entirely to the arrival on the scene of other exporting countries, notably Chad and Nigeria, who have both developed their exports of gum arabic and taken market share from Sudan in the process.

During the last 30 years, there has also been the emergence of a whole new class of producing countries, each of which contributes a small amount to the total export volume. In 1970, there were 5 countries in Africa producing gum arabic (Senegal, Nigeria, Sudan, Mauritania and Mali), and in 1980 only 8 African countries were involved in the gum arabic market (Senegal, Nigeria, Sudan, Ethiopia, Mali, Niger, Mauritania and Chad). By the year 2000, this list has doubled; there are currently 15 different countries involved in either the production or the export, or both of gum arabic (Senegal, Mauritania, Mali, Burkina Faso, Central African Republic, Ghana, Nigeria, Niger, Cameroon, Chad, Ethiopia, Sudan, Somalia, Kenya and Tanzania). Some of these countries are simply re-exporters of gum whose production originates in a neighbouring country – for example, it is believed that most of the gum arabic from Senegal are re-exports from Mali and Mauritania and that most of the gum from Cameroon originates from Chad and Sudan. The Central African Republic re-exports gum that originates in the Sudan and Ghana is not a producer of gum arabic.

The figures used for producing the previous graph include both types of gum arabic exports – hard and flaky. The recent increase in market shares of non-Sudanese producers has come mainly on account of an important development in the export of flaky gum, produced in particular by Chad. Out of the estimated total exports of 55.000 tonnes in 2000, almost a third were contributed by Chad (17.500 tonnes). Most of this is gum arabic of the flaky type, but there are no precise statistics available on the exact breakdown into the two categories.

4.2. Exports by species

In 2000, the following is the estimated break down of total world exports by species :

Acacia Senegal – hard gum	: 29,150 tonnes
Acacia Seyal – flaky gum	: 25,850 tonnes

4.3. Production and exports from Sudan

Gum production in the Sudan has developed over generations in a tradition handed down from father to son. This long experience is not easily matched in other countries and in Sudan it is backed up by a well-established extension and research service. In Sudan, gum producers are in general settled farmers and gum is well entrenched in the agricultural rotation. Every Acacia tree in Sudan is under the rightful ownership of somebody who can look after the tree and tap it on his own behalf. The initial pre-export processing and marketing are in the hands of a public monopoly, the Gum Arabic Company which sets the local and world price for the commodity given its importance in the trade of this product.

Despite this excellent organisation of the sector, gum arabic production in the Sudan has declined over the past 30 or 40 years from a peak of around 50.000 tonnes in 1967/68 to its current level of around 20.000 tonnes (see following table) :

Sudanese average production over the period.1960-2000

Average production per period	Tonnes
1960-69	46.000
1970-79	34.000
1980-89	28.000

1990-98	23.000
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Amongst the various different explanations provided for this reduction in the level of production, one can note – the successive seasons of drought, deterioration of soils, migration of collectors and a general discouragement of the producer on account of the drop in buying price offered for the hashab variety by the Gum Arabic Company since 1995. Many collectors now sell their gum in Chad or the Central African Republic.

4.4. Production and exports from French speaking West and Central African countries

Gavens (1997) has produced figures on the production and exports of the French speaking countries of Western and Central Africa for the period 1991-96. These figures are reproduced in the following two tables, the first giving average production by species for the period 1991-96 and the second the exports by country during the period 1991-96. The latter table has been updated using figures provided by ARD in a personal communication.

Average production by species and by country, 1991-96
In tonnes

Country	Variety/species	Annual production
Chad	A. senegal	3.500
	A. seyal	1.500
Mali	A. senegal	Total 500
	A. seyal	
Mauritania	A. senegal	400
Niger	A. senegal	150
	A seyal	115
Burkina Fa so	A.senegal	Total 200 –300
	A. seyal	
Senegal	A. senegal	700

Exports of French speaking Western and Central African countries, 1991-1998
In tonnes

	1991	1992	1993	1994	1995	1996	1997	1998
Chad	2228	2450	3701	4558	7001	7365	8527	12584
Cent.Afric.Rep.	74	78	33	119	126	639		
Senegal	262	261	459	362	662	213		
Mauritania	32	48	55	166	258	256		
Cameroon	95	647	841	1031	161	560		
Niger	27	155	228	240	110	242		
Ivory Coast	0	0	26	50	15	20		
Total	2718	3639	4884	6164	7671	9295		

Chad's exports have increased rapidly throughout the period, especially since 1995 and this country is now the second most important exporter after the Sudan and is specialised mostly in the exports of flaky gum. The other French speaking countries have maintained their relative positions, but as explained earlier, a large proportion of the exports declared by countries such as the CAR, Senegal and Cameroon are in fact re-exports originating in neighbouring countries.

4.5. Exports from Nigeria

Nigeria has always been one of the major West African producers of gum arabic. It figures on the list of countries engaged in this production in 1970 and is currently the third most important exporter to the world market. The following table gives the estimated exports over the last ten years that have come from Nigeria, as either direct exports or re-exports.

Nigeria exports of gum arabic, 1991-2000

In tonnes

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6706	8358	7042	9822	9914	12164	10199	4188		10450

Nigeria's exports have in the past been subject to relatively wild fluctuations in the amount delivered to the market, which cannot be easily explained. Local production is of both hard gum (*acacia senegal*) and flaky gum (*acacia seyal*), the latter having increased in importance in recent years.

As a result of the bombing of the World Trade Centre in September 2001, the United States have put into action a programme designed to reduce their dependence on the Sudan, considered to be too close to terrorism for comfort. As regards gum arabic, Nigeria has been singled out as a possible replacement for the Sudan and currently the USAID is in the process of mounting an important programme of assistance to the gum arabic sector in this country.

5. Organisation of production

5.1. Sudan

In the Sudan; *Acacia Senegal* grows both in natural stands and in man-made plantations organised at the village level.. The *Acacia Seyal* on the other hand only grows in natural stands and regenerates through natural re-seeding.

5.1.1. Land tenure

In theory in Sudan all land belongs to the State but in practice and over the course of time individuals have acquired rights over the land to the extent that they are considered the rightful owners of the land. The main division of the land is into village-level blocks and its allocation among different village members is under the control of the village headman. The area attributed to an individual family depends on the size of that family and their status in the village. A descendant has in general more land than a new comer. A new comer can rent-in land and share crop gum on other owners' holdings.

5.1.2. Land use

In the sandy areas of the Western Sudan the pattern of land use within the village is one of current cultivation and fallow on which there may be *Acacia Senegal* trees planted. The system is known as the "gum cultivation cycle" or the "bush-fallow system of shifting cultivation". Under this system, each plot of land is cultivated under crops for about 4 to 5 successive years followed by a period of 15 to 20 years of fallow under regenerated *Acacia Senegal*. The fallow period rests the soil and the *Acacia Senegal* tree protects it from wind erosion and improves its fertility in preparation for another period of cropping. The gum provides the farmer with income during the dry season. At the start of the second period of cropping on a given plot of land, the gum trees are felled at ground level so that they may coppice when the plot is subsequently taken out of cultivation again.

The system ensures optimum and sustainable utilisation of natural resources. Animals move under the trees during the dry season without harming the trees which in turn provide fodder and grazing. When the trees are felled to allow cultivation, the wood is used for fuel, building and fencing materials.

This system has the advantage of providing every tree with an “owner”. Each acacia tree, no matter how far from the village, is attributed to a given member of the village; he is responsible for looking after it, tapping it and collecting and selling the gum produced.

5.1.3. Restocking with *Acacia Senegal*

The bush-fallow system has over the years undergone substantial deterioration, particularly in the main gum producing areas of Kordofan and Darfour, as a result of recurring droughts. Tree mortality has been especially severe in the northern parts of these regions, resulting in the partial collapse of the bush-fallow system. In light of this, the Government of Sudan, with the aid of aid donors such as UNSSO, or through the Forest Extension Unit of the Forest National Corporation (FNC), has been undertaking over the years various projects to restock the gum belt in Kordofan and Darfour. In these projects, the farmer is provided with seeds and seedlings to plant in his own fields.

The forest service has also adopted a strategy of establishing plantations of *Acacia Senegal* inside forest reserves to act as buffer plantations. There were, at the end of the 1990s, about 12.500 hectares under such plantations. These are rented out annually to gum tappers on a share-crop basis. Gum plantations provide an important part (30-40%) of the FNC annual planting programme and the Sudanese government also decreed that all mechanised farming schemes should plant trees on 10-15% of their area to act as shelter-belts, using *Acacia Senegal* as the main species.

5.1.4. *Acacia Seyal* in Sudan

The *Acacia Seyal* species is in Sudan, very sensitive to the type of soil and only grows in the heavy cracking clay plains of the eastern, central and southern Sudan. These soils are a speciality of Sudan and are rarely found elsewhere in Africa in such large tracts. Hence the potential production of talha flaky gum of the Sudan is very large – estimated at least twice the amount of hashab hard gum. However, this type of gum is not being promoted by the Sudan which remains attached to its reputation and market dominance in the hashab sector of the market. The proportion of gum talha in Sudanese production of gum arabic is usually around 5-15%; it varied from less than 2.000 tonnes in 1992 to over 11.000 tonnes in 1994.

5.1.5. Tree growth

The rooting habits of the *Acacia* species are especially suited to making maximum utilisation of available moisture. Germinating seeds develop a long tap root reaching about two metres in two months, then growth of lateral roots develop in the second and third years. This branching and far rooting enables the young seedling to continue to grow even after the rains have stopped.

Trees are tapped when they reach the height of about 1-1.50 metres, after a period of 3-7 years depending on the method of establishment (seed or plant). The two first years represent the period when the acacia tree is in the greatest danger from animals or neglect, before it can be cropped. The acacia tree reaches full maturity at 20-25 years old, but there are many authenticated examples of trees over 40 years which are still capable of producing gum. In general, production seems to slow down after the age of 25.

5.1.6. Gum collection

Gum hashab or kitir is collected from *A. Senegal* by tapping, whereas all gum talha from *A. Seyal* is collected as a result of natural exudation. Tapping begins when the trees are just starting to shed their

leaves, around the end of October or the beginning of November in Sudan. In order to reach this stage, trees have to grow for a period of 3 to 7 years depending on the method of establishment. Again in the Sudan, there are two tapping seasons, an earlier one before the onset of the colder weather which is between the months of December and March and a later one in the dry spell after the month of March. Some writers limit the tapping season to the period from November to then end of February.

After tapping, exudation occurs gradually forming a hard but slightly elastic nodule. As more gum exudes the outer skin expands or cracks and the nodule grows to about 15 –30 mm in diameter. When the outer casing becomes so hard that the liquid cannot force it to expand any further, the nodule is ready for picking. The time taken to reach this stage is from 3-6 weeks and as soon as the nodules are picked, new ones start to form and within 10-15 days a second picking is possible. Several branches are treated in this manner at one tapping.. In the following years, other branches or the reverse side of the same treated branches are tapped. An average of four pickings is common, up to seven. The nodules are picked by hand and placed in general in a basket carried by the collector.

5.1.7. Yields

Yields of gum from individual trees are very variable and little reliable data are available on which to base sound estimates of “average” yields. A figure of 125 grammes of gum per tree and per season is often cited as an average yield. Yields of several kilos have been reported. In Chad, in the region of Dourbali⁶, yields of 4 kilograms per fortnight are common. In Sudan, yields from cultivated *A. Senegal* are said to increase up to the age of 15 years when they level out and decline after 20 years. At this stage, they can be coppiced and after a suitable period of time and pruning, tapping can recommence on the new stems.

5.1.8. Post-harvest handling

At present little cleaning or sorting is undertaken by the collector who sells it to the small village trader. These actors may undertake some cleaning or sorting, but this is generally done by the larger wholesale traders who buy the gum and who sell it on to the Gum Arabic Company, in general after transporting it Port Sudan. If the GAC buys the gum locally, it cleans and sorts at its own warehouses situated in the regional centres of the gum belt. On arrival at the GAC depot at Port Sudan, every consignment of gum hashab is re-cleaned, sorted graded and in certain cases, subjected to the kibbling process

5.1.9. Key institutions

Gum Research Division of the Forestry Department

Created in 1958, this division has the job of carrying out research into silviculture and to liaise with the extension department to disseminate information to producers on how to grow trees and improve on production techniques. During the 1980's and 1990's, with the help of the GAC, chemical and biological research was introduced which studied various aspects and characterisation of gum arabic and other gums. Recent research topics have included the characterisation of gum talha, emulsification properties of gum talha, factor affecting storage of gums, the effects of spray drying on the physico-chemical properties of gums.

The Producer Associations

⁶This region also received an organic gum agreement for export to an American firm in the year 2000/01.

Producer Associations in the gum arabic sector were first created in the Sudan in the early 1980's with a view to facilitating and co-ordinating efforts of producers in the field of production and marketing. They were founded in all important centres of production (11 states). Their representatives participate as share-holders in the Gum Arabic Company (see below) and are nominated (40% of the total) on the Board of Directors. This situation has enabled the producers to gain extra income from the dividends paid on their shares (18% of the total) and their role in the decision making process has meant that they have had an influence on prices and marketing policies of the Company.

The Associations have become one of the main channels for the dissemination of information, execution of development projects, formation of co-operatives and facilitation of credit lines and generally in safeguarding the interests of producers.

The Gum Arabic Company

This company is at present under majority state ownership, but the producers associations own 18% of the shares. It was created in 1967/68 and has a monopoly of raw gum arabic exports from the Sudan which it ships world wide to its official appointed agents in each consuming country. However, the GAC plays an important role in the local marketing of gum arabic.

The farm-gate price is fixed by the government and the gum is sold by the local merchants on the local auction market. The role of the GAC starts at the auction market where it supervises and enforces the announced market price. Gum arabic that is not bought by an independent licensed buyer or for which the official price is not offered must be bought by the GAC at the official base price. Gum that is bought by a licensed merchant at these auctions is then cleaned, sorted and transported to Port Sudan and then sold to the GAC at prices fixed for each grade to allow the seller a margin of profit. The GAC then re-cleans, grades, kibbles⁷ and exports the amount that the market will bear.

In recent years there has been a growing belief that the present monopolistic arrangement should be de-regulated to allow free entry into the industry and to enable anyone to export gum arabic. This view is backed up by the observation that the current system is being abused by the active smuggling of gum to Chad, Nigeria and other countries of the region. Currently, the system appears to have been partially liberalised, because the export of semi-processed gum by private companies is now permitted by the Sudan. This has led to investment in these processing lines by various companies in recent years (see below).

The Gum Development Corporation

The GDC was established 1994 as an independent, non-profit making institution aimed at the promotion of gum arabic at all levels. The founding members are – the Forest National Corporation, GAC, Producers Association, the producing states, certain development banks and representatives of overseas processors and importers.

The activities of this Corporation have included – the discovery of new uses of gum arabic, the promotion of processing and investment in new processing lines, encouragement of the production of gum arabic, the conquest of new markets and the fight against synthetic substitutes

5.2. Chad

5.2.1. Modes of production

⁷ A process that involves breaking down of the larger lumps by a hammer mill and the production of smaller granules of more uniform size in preparation for export.

In Chad, there are two major modes of production. The dominant mode of production of gum is the “collection/gathering” mode. Under this system, the gum trees (both species) are spread out in natural stands throughout the gum belt which stretches from Lake Chad in the West to Abeche in the East for kitir gum, and the region of Am Timan for the talha gum. The natural stands are tapped and the hard gum collected either by nomads during their various movements from place to place, or by the more sedentary populations in near-by or even remote villages. This type of exploitation is relatively well adapted to areas of low density populations and wide open spaces, as in the case of central Chad where production is concentrated. Under this system, there is very little effort put into improvement of the varieties which are left to grow in the wild. In addition, since property rights are not well enough defined, regular conflicts break out between competing populations of collectors over the appropriation of the gum from different areas. Each group makes claims on the basis of his interpretation of the various traditional rights pertaining to the use of the land.

The other major mode of production is that of village level plantations. These are small or medium sized plantations (varying from less than 1 hectare to 25 hectares) on land that has been allocated by the village or inherited, under the traditional land tenure system. These areas have in general natural stands of acacia gum trees and some amount of replanting is undertaken every year by the owners to renew the ageing tree stock. On these plantations, the gum tree is often tapped by the men and collected by the women and sold by the individual family with tenure.

In Chad, a recent attempt has been made to develop industrial plantations on a large scale, using land that has been awarded a definite ownership status – a property right and a title. At a place called Dougia, 80 kilometres north of Ndjamen, an area of 900 hectares was set aside for planting of Acacia Senegal trees whose seedlings were brought from the Forest Service in Ndjamen. However, as a result of a conflict with the local population, 200 hectares were set alight to fire and the plantation has not yet produced any gum.

5.2.2. Natural regeneration of Acacias in Chad and potential production

Since the formation of the Sahara, the Sahel has followed the ebb and flow of the desert at a pace determined by the successive droughts. In this respect, certain natural gum plantations in Chad that had been decimated by the drought of 1984 have been naturally regenerated as a result of a number of good rainy seasons. At the moment, the gum areas of Chad are in the process of an extensive degree of natural regeneration for the same reasons. This “mobility” of the gum growing areas makes it difficult to estimate in advance the amount of gum that will be produced. If the rains are good, then the probability of a good season for gum collection and production increases.

The potential level of production has been estimated by the FAO in its 1996 study at around 15.000 to 20.000 tonnes, but could be as much as ten times that amount if the total potential of the country could be achieved. At that period, with only 5-10% of the total production potential being exploited, Chad produced some 5.000 tonnes of gum arabic. Production has now risen and is estimated by the Gum Arabic Bureau of the Forestry Directorate of the Environment Ministry to have reached 15.000 tonnes in the year 2000.

5.2.3. Producer groups in Chad

There are at the moment several different producer groups actively engaged in the marketing of gum arabic. The region of Dourbali has at least two sorts of producer groups, one on a larger scale, that groups up to 350 individual producers and operates under the direction of an important local trader who is also a producer. This trader advances credit to the individual producers who sell all their gum through him in return. Another type of grouping is that of the village of Linia, where the producers are grouped under a “Committee of Gum Arabic marketing”. This committee sets the selling price for the gum and organises its stocking. The gum is sold individually on the marketing day that the

Committee fixes. There are certainly other types of grouping but the mission did not have time to investigate all of these.

5.2.4. The Chadian marketing chain

The exporters

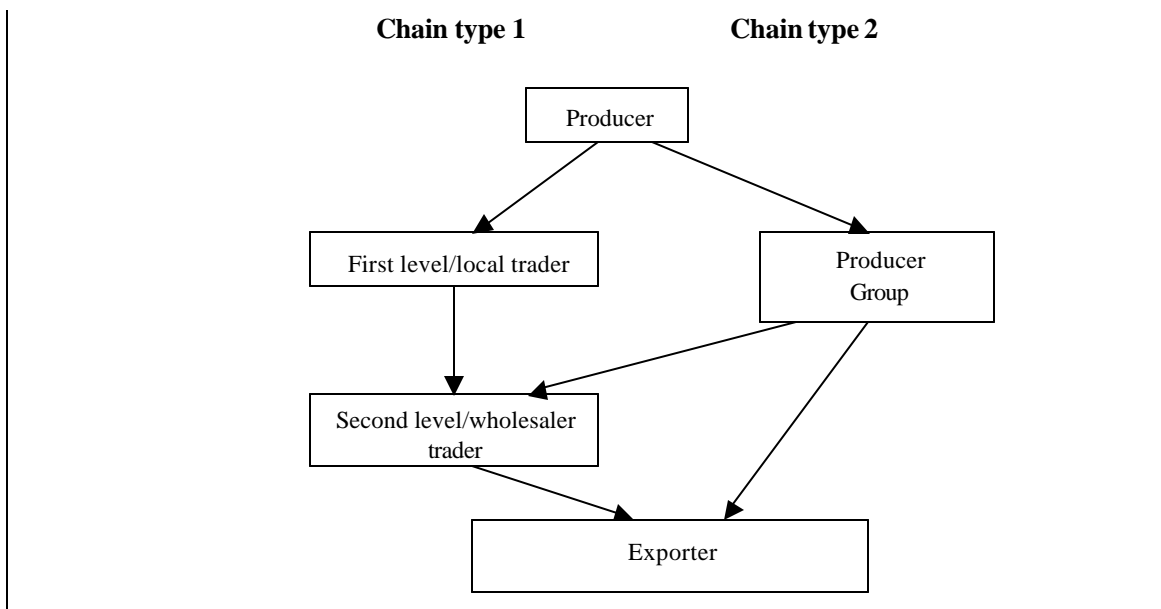
For a number of years the only major actor in the sector in Chad was the SONACOT (Société Nationale de Commercialisation du Tchad), a state owned company which collected the gum in all the regions of production on the basis of a fixed price and this up until the year 1979 (it did not have a monopoly however). During the early years of the 1980s, the sector was privatised and a foreign importer in association with a few important Ndjamenan merchants local partners helped to create the STEGA (Société Tchadienne de l'Exploitation de la Gomme Arabique). This structure exploded a few years later but it served as a starting point for some of the present-day gum exporters from this country (SCCL, for example).

There are at the moment about 8 to 10 major exporters of gum arabic in Chad, grouped together in an Association of Exporters of gum arabic. In fact this association has not yet been formally constituted because of differences of opinion and strategy of certain exporters. The Société SCCL, for example, is an exclusive agent for CNI and guards an independent line which distances it from the other exporters.

The majority of exporters just undertake manual sorting before exporting their gum. However, SCCL has invested in a mechanised sorting line and the Société Acacia has invested in a quality testing laboratory, a drying oven and a kibbling/crushing line. All these exporting firms undertake bagging before selling overseas. Chadian gum arabic has to be sent by road to Lagos or Douala before it is loaded onto a boat. Delivery takes up to 45 days.

The local marketing chain

There are two types of local marketing chain, one in which the gum is sold through the local trader network and one where the gum is sold through the Producer Groups. The following diagram illustrates these two chains.



In the first type of chain, the producer sells directly to the local trader who sells it on to the wholesaler in Ndjamena (Marché de cent fils). In the second case, the producer group sells the product either directly to the exporter or to the wholesaler in Ndjamena. As we shall see (section 7.1 below) the price that the producer receives is not the same in each of these two cases.

5.3. Mali

5.3.1. Potential production

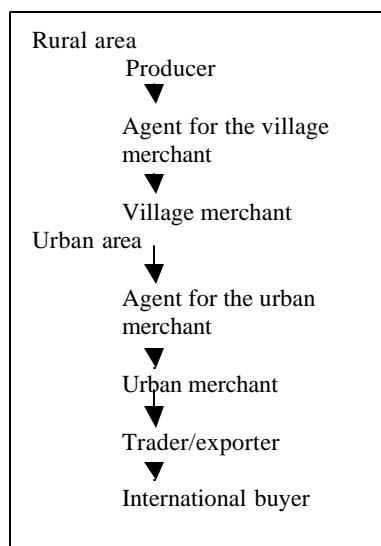
The zones of production of gum arabic are Kayes, Niafunké, Gao and Segou. In light of the new policy introduced by the Government since 1975, there has been an important reconstitution of the gum plantations throughout the entire production region. The potential production of the different regions taken together can be estimated at around 12.000 tonnes (6.000 hard gum, 6.000 flaky gum). In order to be able to obtain such a level of production it will be necessary to inform the collectors/producers and to motivate them with attractive buying prices.

5.3.2. Mode of production

The dominant mode of production in Mali is the collecting/gathering mode, undertaken on natural stands of acacia trees by men from small isolated villagers. These villagers often travel long distances, up to 40 kilometres, with their donkeys, food and water, to collect the gum. They collect only small quantities of gum during a trip (2 to 5 kgs in some cases) and up to 100 kgs for a season on average.

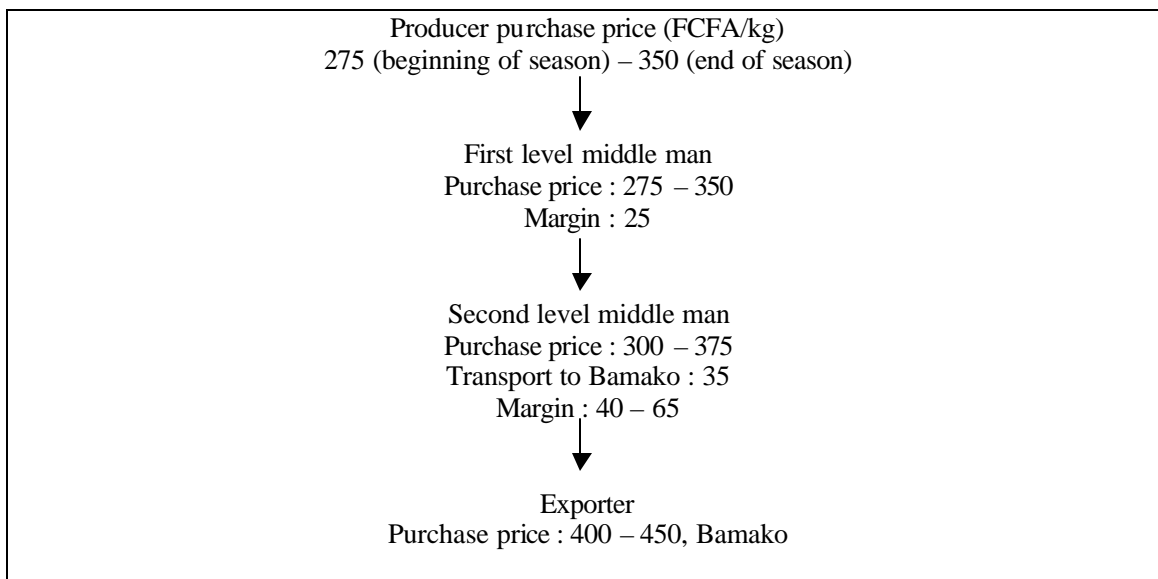
5.3.3. The marketing chain in Mali

The marketing chain in the regions of Kayes, Segou and Gao is characterised by the relatively large number of intermediaries involved.



This traditional system which involves several different intermediaries, implies a downward pressure on the price finally received by the producer and on his income from this source. Prices as low as 50 FCFA/kg have been recorded in some regions (Cinzana). A private Malian company has attempted to get around this problem from the 2000/01 season by purchasing directly from an agent placed in the region who works through a selected intermediary for a group of villages.

The following diagram gives the break-down of costs in the marketing chain for flaky gum put in place by this exporter.



The exporter buys directly from his agent (second level middleman) to whom he has given a certain amount of money as an advance for purchasing the gum. The first level middle man could be the village shop keeper who gives credit in form of advances of sugar or tea during the difficult period (June to August) and recovers the gum as payment during the harvesting period. In order for this system to be broken, alternative sources of credit must be made available to the producer during the off-season.

5.3.3. Malian exports of gum arabic

The following table gives the exports of Malian gum arabic between 1989 and 1999 :

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Tonnage	391	69	75	32	77	167	258	74*	518	751	688

* A certain number of exporters sold their production directly at the exporting ports
Source : G. Merlin, 2001

However, this table may not be a full representation of the reality of the situation of Mali's exports, as a certain number of exporters do not declare their exports in the country of production. In the region of Kayes, it is certain that a large part of the production passes the frontier with Mauritania and Senegal. In 2001 total exports can be estimated as follows :

2 minor exporters	40 tonnes
Major exporter	300 tonnes
Exports from Kayes	400 tonnes
Total Mali	740 tonnes

Mali has suffered and continues to suffer from a poor reputation as regards the quality of its gum. This image is due first to an absence of quality control (physico-chemical analysis) of the two types of gum that the country exports. It is due also to the custom adopted of mixing the different types of gum. This habit originated at a time (1980's –1990's) when European buyers bought at a low price, whilst selling

it at a relatively high price (30-40 French Francs/kg). In 1996, the price of Malian gum varied from \$2-\$2.50/kg, to-day it is in the region of \$1.15/kg for hard gum, \$0,75/kg for flaky gum, C+F Dakar. Certain authors believe that the only way to increase the value of this export is to proceed with the refining of the gum locally⁸.

5.4. Nigeria

5.4.1. Research and Extension

According to the ARD workshop, research and extension are organised nationally by the Federal Government and regionally by the State Governments. In the past increased resources have been made available for research on gum arabic, including variety improvements of both types of Acacia. This research tends to benefit Federal or State level plantations. Extension efforts have gone into the improvement of re-planting practices on non-state owned lands but these efforts have not been enough to satisfy the demand for plants to produce gum, in particular gum from the Acacia Senegal.

5.5.2. Production and harvesting

Again according to the Workshop organised by the ARD in Nigeria, there are a small number of both private and public plantations with Acacia Senegal trees for the production of gum arabic using hired labour. But most gum arabic is harvested in the wild, not on plantations, in general by nomads who see gum arabic as an ancillary economic activity.

5.5.3. Sorting and grading

After having been sold on the local market for prices that vary with the different grades, sorting is not done again until the gum reaches the exporters warehouse – at which point much of the gum is found to be adulterated

5.5.3. The marketing chain

First in the chain are the local markets where harvesters and gatherers sell gum on market day. Area or regional markets are the next stage and constitute an aggregating point for locally marketed gum before being sold on to exporters' agents. National markets are large towns (Kano, Maiduguri, Maigatari) where the six main national exporting companies grade store and sort consignments of gum arabic until they are ready to be shipped. All gum is shipped through the port of Lagos.

5.5.4. Foreign versus national exporters

Using the ARD Workshop as a source, it is possible to distinguish two separate marketing channels for Nigerian gum arabic – one under the control of the six major Nigerian exporters and the other in the hands of foreign exporters. Whereas for the Nigerian exporters gum arabic represents a major business, this is not the case of the foreign exporters who are also importers more often than not. They can use gum arabic as a means of converting Naira earned through their import business into hard currency using the opportunities offered by the parallel exchange rate. This places the foreign exporter in an advantageous position relative to his Nigerian counterpart and influences the price that this category of exporter can pay for their supplies of gum arabic. Since their primary motive is arbitrage, they can afford to pay an equivalent rate for lower quality gum to what Nigerian exporters pay for unadulterated, higher grade gum. Mixing of gum is encouraged in this way.

⁸ G. Merlin, Etude de Faisabilité d'une Unité de Raffinage de Gomme Arabique au Mali, Mars 2001.

5.5.5. Finance

The gum supply chain is financed through a forward payment system whereby the exporter pre-finances the national traders for the purchase of the season's crop. This system of finance has the negative consequence of encouraging the adulteration of supply, because the more quickly that the traders fill their orders, the more quickly they obtain their next forward payment – since the gum is relatively scarce, they often fill their orders with mixed qualities of gum.

5.6. *Niger*

5.6.1. Brief history

During the 1960s and 70s, gum arabic made a significant contribution to Niger's economy (second most important export after groundnuts). In 1979, exports were 2600 tonnes. However, during the next two decades, these exports diminished severely, first on account of the disappearance of the parastatal monopoly, Copro-Niger and also because of the recurrent droughts during this period (1973/74 – 1983/84). During the 1990s, the majority of Niger's gum was exported through the informal sector to Nigeria, but it is during these years that a private firm, ASI, first got interested in trading gum overseas and has planted over 200 hectares of acacia on its privately owned land. As a member of the Cooperative of Niger Gum Producers, it currently contributes to the promotion of gum arabic from this country. The members of this Co-operative (generally large scale traders or retired civil servants, not small scale village producers) have all planted acacia trees with a view to collecting gum (100-200 hectares in all). They have for the moment, not collected any significant amount of gum are in need of technical assistance.

Over the last two or three years, the gum arabic sector in Niger has received considerable political backing, notably from the President, who has initiated mass planting programmes for the acacia tree (18 million trees to be planted in 2002).

5.6.2. Potential production and areas of production

Currently, the potential production of Niger can be estimated at between 2.000 and 4.000 tonnes of hard gum and 900 tonnes of flaky gum. This production is spread out over three major "basins" :

- An Eastern basin which stretches from the southern half of the region of Diffa to the South-Eastern part of the region of Zinder. Much of the gum from this area is traded into Nigeria through the informal sector. Its potential is estimated at 200.000 hectares of natural stands.
- A Central basin, covering the north of the region of Maradi and the South East of the region of Tahoua.. It is estimated that acacia senegal covers more than 50.000 hectares and important areas are also under man-made plantations
- A Western basin, covering the Tillabery region where the natural forests are estimated to cover 40.000 hectares and are essentially concentrated in the Liptako Gourma region. This region also has important planted or re-planted areas under acacia trees.

Current production can be estimated at around 1.000 tonnes. The only official exporter, ASI, buys and exports 400-500 tonnes of hard gum and 150 tonnes of flaky gum. Its own plantations yield only an insignificant amount of production however.

5.6.3. Modes and techniques of production

Little is known about the modes of production in Niger, but it can safely be presumed that the major mode of production is the collecting/gathering mode. In addition, a significant number of larger sized plantations have been created by private individuals in the last 5 years, varying in size from 25 to 150 hectares.

The World Bank project, *Projet de Promotion des Exportations Agro-Pastorales (PPEAP)* has currently under review requests from different co-operatives to develop over 900 hectares of plantations of *acacia senegal*.

The problem with these co-operative plantations, as it is with the older ones, is that the planted trees have not been selected properly. In the past, they have been taken from various sources (Sudan for example, or local sources), but have not been subject to any rigorous selection and screening process. They are unlikely therefore to produce gum consistently and in significant amounts. There is an urgent need for the establishment of a seed bank, perhaps at the sub-regional level, that would supply selected seeds for planting programmes in the different countries of the sub-region.

At the village level, the current state of knowledge concerning the techniques of production of gum arabic is at the best very partial. There is often mixing of the two types of gum at the collection stage, gum is not dried consistently before selling and the lack of knowledge concerning tapping techniques is also evident.

A FAO technical assistance project (TCP/NER/0066) has studied these problems and come up with a series of recommendations aimed at dealing with them. Most important amongst these are

- Training producers and collectors in the tapping, harvesting, sorting and bagging of gum arabic
- Initiation of producers in the identification of the two major species of acacia gum trees (*Acacia senegal* and *Acacia seyal*)
- Training in the establishment of plant nurseries and the production of seeds
- Extension in the area of modern tapping tools and the training of local blacksmiths to produce these on a large scale
- Training of villagers in the techniques of establishing and managing village gum plantations.

If these recommendations were carried out, they would go a long way to helping the recovery of the gum arabic sector in this country.

5.6.4. A national strategy for the development of the gum arabic sector in Niger.

The Government of Niger, through its Ministry of Water, Environment and the Struggle against Desertification, has, with the assistance of an FAO Technical Assistance Project, set out a national strategy for the development of the gum arabic sector over the coming years. This strategy is to be presented to a seminar at the end of October 2002 for confirmation and to mobilise donor support for the different programmes suggested.

The strategy is based on the objectives of creating incomes and employment in the gum producing areas, the sustainable management of gum resources through the development of existing gum plantations and the creation of new village level plantations and, lastly, the organisation and reinforcement of the capacities of all the actors in the production-marketing chain.

Different activities are presented in the document to achieve these objectives

Income and employment creation : this is to be achieved by activities such as the setting up of buying points, the establishment of a credit system adapted to the needs of producers, support for the setting up of local management structures for gum plantations, setting up a system of extension and training in techniques of gum production, putting into place an organised chain of collection and marketing of gum arabic, putting into place a system of taxation adapted to the needs of the sector.

Sustainable management of gum resources : this is to be achieved by efforts in the pursuit of further knowledge of Niger's gum potential. Furthermore, plans are to be made and implemented for the creation of 200.000 hectares of new gum plantations during the next 10 years.

Reinforcement of capacities : this is to be undertaken at different levels. Firstly, at the level of government forest services responsible for the supervision of the production. Also concerned are the Government services responsible for the monitoring and evaluation of the gum programme. A geographical information system and a market information system are also recommended. Next at the level of the producers, training programmes in the area of tapping and collection of gum arabic are to be developed.

Accompanying measures : these cover areas such as the establishment of an export label for Niger's gum arabic, the setting up of an ecological monitoring of gum plantations and the monitoring of tree productivity levels, carrying out a genetic evaluation of the two major acacia species, and the putting into place of an operational system of gum marketing.

These proposals are to be presented to potential donors at the seminar to be held at the end of the month of October. They will be considered by representatives of the World Bank amongst others. We consider them to be like the curate's egg – good only in parts – and would prefer more emphasis to be made on the important role that can be played by the private sector in the future development of the sector in Niger.

6. Gender, environment and investment issues

6.1. Gender issues

Women are not in general involved in the collection of gum arabic, this is a job for the men as is the tapping. Except that in some areas of central Chad where there is a division of labour, the women doing the collecting, the men the replanting, pruning and tapping. Women are much more involved at the pre-export processing stage. They are concentrated in the small processing centres of the capital (Chad), or (Sudan) in the GAC regional and central warehouse depots where the cleaning and sorting lines are concentrated. They are involved in the laborious job of cleaning, sieving, manual sorting and bagging of the gum in preparation for its exporting. There are no female merchants involved in the marketing of gum arabic, either in Chad or the Sudan or Mali.

6.2. Environmental issues

Many of the areas where the *Acacia Senegal* and *Acacia Seyal* trees are found are also those areas that have suffered over the years from the desertification process. The soils can be very sandy with a very poor structure highly vulnerable to erosion. The desertification process is due not only to climatic factors, but also to the presence of animals in numbers exceeding the normal carrying capacity of the land. In short spaces of time, large areas of land have been subjected to rapid desertification with the result that all that the land could support is an itinerant agriculture or livestock economy and the exploitation of the gum trees.

In this context, the contribution of the acacia to the protection of the soil is vital. The extensive root system of the *Acacia Senegal* is a precious element in the fight against wind erosion through its effect

on the stabilisation of the land. The *Acacia Senegal* also contributes to soil improvement since, as a leguminous plant, it can fix the nitrogen in the soil. It contributes proteins through the decomposition of its leaves and pods that fall around it. Its positive influence on the organic content of the soil has been shown up by various research studies, notably those of ORSTOM (Bernard-Rerversat, Observations sur la minéralisation de l'azote du sol en savane sahélienne - Senegal, Cahiers de l'ORSTOM, 1977). Finally, the *Acacia Senegal* is an important source of feed for cattle, sheep and goats from its leaves and pods and of wood and charcoal for the population, in addition to the revenue derived from its gum.

In short, the *Acacia Senegal* and the *Acacia Seyal* contribute to the three "F's" – fixing nitrogen, fixing the soil and fixing the population in the environs.

6.3. Recent investments undertaken in this sector in the producing countries.

More and more private exporters in the major producing countries are investing in semi-automated cleaning, sorting and crushing lines. Before, most gum arabic was cleaned and kibbled after its arrival in the consuming countries, but more recently this process has been taken over by the producing countries. Sudan introduced a first kibbling line in the 1993/94 season and Chad has more recently followed suit. The semi-processed gum-arabic is on the average 10% more expensive after undergoing this treatment and is now in a form that is easier to dissolve in water and is ready for the industrial spray-drying that is carried out currently in the importing countries of the Northern Hemisphere. In the Sudan, the undertaking of this semi-processing, enables the private Sudanese exporter to side-step the monopoly on raw gum arabic exports held by the Gum Arabic Company and to sell on the world market.

Other important investments that have been recorded are :

- Chad, Société Acacia, investment in a quality control laboratory, a drying oven and a crushing, sorting line in 2000/01
- Nigeria, Dansa Food (Dangote Group), invested in a spray drying unit, capacity 1500 tonnes/annum, inaugurated in January 2000 in the town of Kano.

This latter investment is an important one to note – it is the only spray drying unit currently located in Africa. It is important to note that whereas the normal export price for raw gum arabic is currently around €1,16 /kg FOB Abidjan, the price of atomised gum is approximately €2,90 /kg. This gives an idea of the interest to be gained from investing in spray drying equipment. The main constraints are in the cost of energy which are generally very high in Africa and in the availability and cost of a regular water supply.

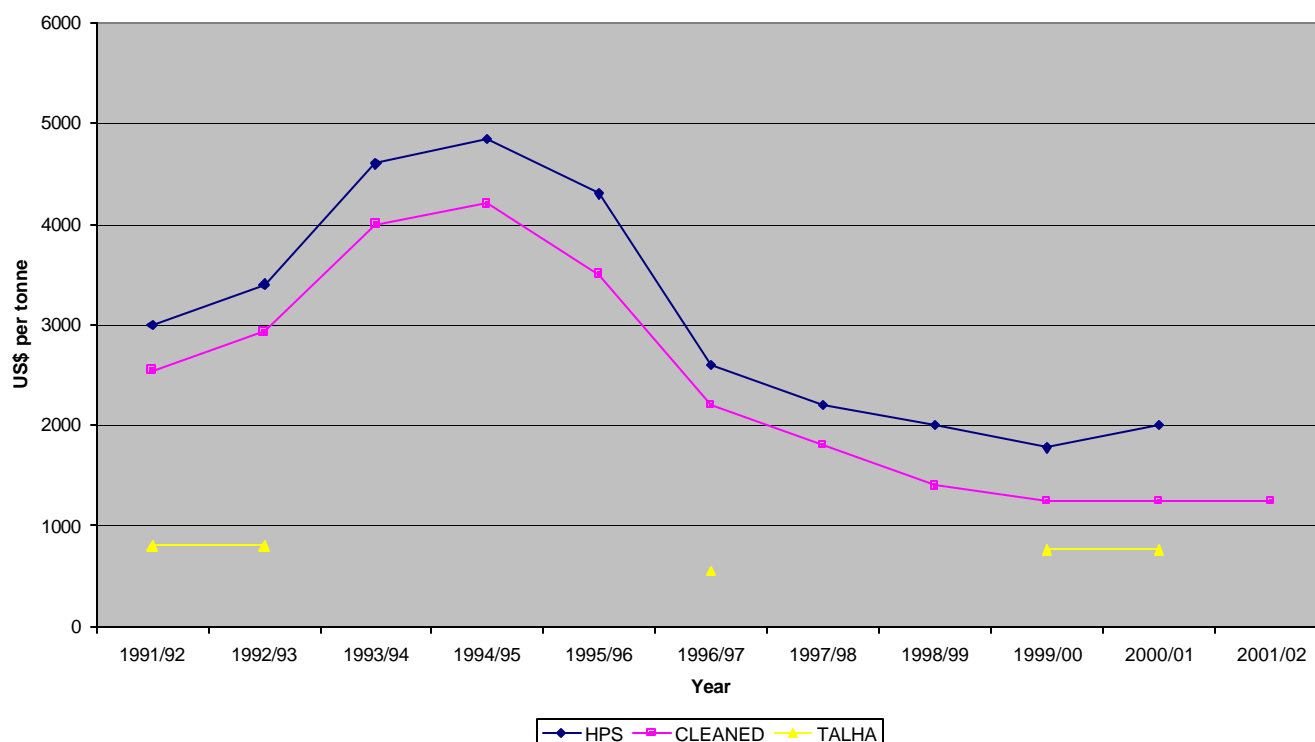
7. Limits on the level of production

7.1. The price level

Export prices

Price is the major element determining the decision to collect or not gum arabic and the actual amount collected. Prices paid to the producer in the various producing countries are not available, but a first attempt to assess this can be made from the analysis of the world price of gum arabic. This price is determined by the Sudanese Gum Arabic company on its exports, Port Sudan, of its different varieties of gum.

Export prices of gum arabic - Port Sudan



The following graph gives an idea of the recent evolution of gum arabic prices on the export market. As can be seen, the price of gum arabic of the hard variety on the world market has fallen greatly over the period 1994/95 to 2001/02. The price of talha gum has on the other hand remained very much the same as the demand has increased at roughly the same rate as the supply.

One positive effect of this decline in prices has been that gum arabic has recovered its competitive position in the market for food additives and other industrial applications. On the other hand, the collector/producer has suffered from this decline.

Local prices – Sudan

A detailed survey carried out in the Sudan during 1999⁹ confirmed that the decisive factor determining the level of production was the level of local producer prices. According to this survey, the local producer price had declined from S£24.000 per kantar (a local measure, equivalent to 45 kilos) in 1993/94 to S£13.590 in 1998/99. As a result of this decline, about 83% of the producers had suffered a reduction in their incomes and about 40% of the producers had made the decision to abandon this activity. If the current trend continued, then over 50% of those responding declared that they would not collect or produce gum during the coming seasons.

In the Sudan, it has been estimated that the collector/producer receives about one fifth of the final export price for his production, one third in the case of Chad. If this is the case, and on the assumption of a yield of 150 grammes per tree and 25 trees tapped per person six times per season, then the average revenue in the Sudan from best quality hard gum arabic is in 2001/02 of the order of 8-10\$US – a very small contribution to the essential livelihood of the populations involved. Under these

⁹Reported in “Development of Gum Arabic Production and Marketing, Sudan”, by El Hag Makki Awouda, FAO, 1999

conditions, gum arabic can only be considered as a supplementary source of income in a holding that associates gum collection with cultivation of other crops and/or pastoral livestock. The only advantage of the income that comes from the gum source is in its timing – it arrives in the middle of the dry season when the needs of the producer are the greatest and enable him, at least partially, to carry over his family until the following food harvest.

Local prices – Chad

For Chad, Gavens¹⁰ has provided some rough estimates of the level of producer prices for the average of two recent seasons (1996/97 and 1997/98). There are three levels of prices, each corresponding to a different stage of the marketing chain (see following table).

Gum arabic prices, Chad 1996/97-97/98

In FCFA/kg	Local market	Ndjamena	FOB Ndjamena
Kitir	300-400	500-600	800-850
Talha	70-90	100-120	300-350

These prices have fluctuated in a similar manner to those of the GAC in Sudan. At the beginning of the 1998/99 season, the price of hard gum in Ndjamena is around 400 FCFA/kg and that of flaky gum is 250 FCFA/kg. Local market prices for flaky gum have risen too in recent years.

By the 2001/2002 season, these prices have fallen and local prices are not the same throughout the country, but depend on which of the two marketing chains are used. They are generally lower at the beginning of the season, higher by the end. The following table gives the latest (2001/2002) breakdown of local prices (for kitir hard gum) for each of the two marketing chains described in section 5.2.4 above (all figures in FCFA/kg). The region of origin is Dourbali

Marketing Chain – Type 1	Marketing Chain -Type 2
Producer price – 150 (beg. of season) – 200 (end of season)	Producer price – 300 (beg.of season) –500 (end of season)
Local middleman Purchasing price – 150 – 200 Margin 50 Transport to Ndjamena 20 Losses in drying 10%	Producer Group Margin 25 Transport to Ndjamena 20 Storage Ndjamena 5
Wholesaler Ndjamena Purchasing price 245 – 300 Margin 175 – 250 Selling price 320 – 550	
Exporter Purchase price 320 –550 Sorting, handling, loading 11.5 Insurance 4.5 Transport Douala 45.8 Transit at Douala 20.0 Margin 50.0 – 100.0	Purchase price 350 – 550 Same
FOB Douala 450 - 730	FOB Douala 480 – 730
Or US \$0.66- \$1.070/kg	Or US \$0.70- \$1.07/kg

As can be seen, it is far more profitable for the producer to sell his gum through a producer group. In order for this to become generalised, however, there has to be an effort made to create these producer

¹⁰ La gomme arabique, le produit et les flux, D. Gavens, 1999

groups throughout the country and to provide them with the necessary credit to keep the producer away out of the hands of the local middleman.

7.2. The lack of seedlings

In the Nigerian case, the Workshop on Gum Arabic placed the lack of supply as the dominant concern of the different participants. Specifically, the two highest ranking constraints were (i) a lack of good quality seedlings and (ii) harvesting technology. The problem of low yielding trees from poor quality seed has been also observed in other countries such as Niger. The basic constraint is the increased supply of improved selected seedlings in nurseries.

7.3. Political stability

Whatever the system of production and the nature of the organisation of the marketing chain, the main challenge for a producing country is its ability to supply the world market on a regular basis, with a fixed or better a growing amount of production. If one link in the chain breaks, the country will no longer be in a position to honour its sales contracts on the world market. In order to be able to collect and transport the gum from the interior to the capital or the main port, the country must be not be affected by civil wars or local conflicts. This is the essential contribution that political stability can make to the development of gum arabic exports, as to those of any other commodity.

7.4. The availability of a satisfactory road network

The importance of a reliable road network for the evacuation of the semi-finished product cannot be over-emphasised. In the remote production areas of Chad, around An Timan, for example, the road network is non-existent. The only access is by an uncovered road which is impassable during the rainy season. Many other regions of the gum belt are in a similar situation and suffer generally from isolation from the rest of the country on account of poor roads and other means of communication.

7.5. The limited availability of water and labour in the production zones

In the isolated areas of natural populations of Acacia trees in Chad, and also in Sudan or Nigeria, it has often been noted that there is a lack of labour available locally for undertaking the tapping and subsequent collection of gum arabic. This is also related to the lack of water in these areas. In the survey of the Sudan, referred to earlier, most of the replies indicated that they did not receive water or water services at all. A decreasing number received water in 1998 (2%) compared to the previous years (8% in 1993).

This has encouraged different donors to encourage the establishment of wells and pumps in these areas. These can however be a danger to the environment if they lead to the attraction of large numbers of animals who can overgraze the area around the well and destroy the trees. As a result, the management of these wells and their pumps has become a central issue for donors. The important element is to engage a local village association in the management of the pump. This association has therefore responsibility for the use of the key and the distribution of water from the well.

7.6. Finance and the non-presence of banks in the remote production areas

There are very few direct costs which the prospective gum collector has to incur before starting up this activity. The purchase of a tapping tool, which is minor expense, is the only direct cost involved. In certain cases, when the cultivator is not in a subsidised re-forestation scheme, he would have to

purchase his own seedlings for planting. The major costs are indirect ones – in particular the cost of his subsistence during the tapping season. The producer is often in a position whereby he has to mortgage his future gum production in order to pay for his present subsistence.

There are virtually no banks in the gum producing areas of the Sahel. In certain cases, a local mutual credit bank may be available, but that is rare. In the absence of any bank, all transactions are in cash and credit is only available from the informal sector, in general the local merchant. It is to them that the gum collector turns to obtain enough credit to be able to buy essential food and other items throughout the dry season; in turn, he mortgages his future collection of gum arabic to the merchant in order to pay for this credit.

In the Sudan survey, referred to earlier, it was found that most producers were in fact not selling their gum arabic at the official prices set by the Gum Arabic Company, but were selling to the local merchants at lower prices. Of the producers that sold to the village merchant, about a quarter received some form of credit for tapping and collection – whether in the form of cash, water, transport or food or a mixture of all of these.

If there were available an alternative source of credit, through a local bank of some sort, then these informal arrangements could be avoided and the producer be in a better position to profit from his gum production.

7.7. Climatic factors

Water is of course essential to growth and survival of the Acacia tree, but the average annual rainfall within an area seems to have little effect on the amount of gum collected. The effects of long-term droughts have been clearly demonstrated during the past (loss of production after the droughts of 1968- 1972 and 1982- 86). The length of the rainy season is also a limiting factor. Longer rainy seasons prolong the growing period for both agricultural crops and trees. On the one hand, this is beneficial because it produces healthier trees, but on the other hand it limits gum production – either by keeping the farmer busy in his fields or by prolonging tree growth up to the cold spell. In such a case, tapping is useless before the trees shed their leaves.

7.8. Natural predators and related factors

Defoliation by locusts represent a major threat to the Acacia tree. Such attacks check the tree's natural growth on the one hand and its regeneration on the other. Such attacks are intermittent however. What is more frequent, is the damage done by man and his animals. With increasing population pressure, greater pressure is being exerted on the land, bringing with it harmful practices such as over-grazing, grass fires and felling of trees for agricultural expansion. These are important factors in limiting the production of gum arabic.

7.9. Encouragement of producer groups to sign contracts (contractualisation).

Producer Groups should, as soon as possible, be encouraged to sign sales contracts with exporters. Contracts cannot be envisaged until these groups are formed, because before this stage is reached the marketing of gum is too atomised or on too small a scale in general scale to be suitable for this type of approach. However as soon as such groups are formed, they should be encouraged to sign sales contracts with the exporters which can ensure that the producers are paid a fixed price over the entire season. These contracts can also serve to guarantee minimum sales for the exporter and so help him to develop a more efficient export sales strategy himself. They can finally serve as a form of guarantee

for the Groups if they apply for a seasonal bank credit, the bank being insured for at least the amount of gum contracted by the Group.

The difficulty of these contracts lies in the low level of literacy in the villages and the absence of any force of law to ensure that they are respected. In this case, they would have to receive a moral guarantee (“caution morale”) from the village headman to give them an extra weight and encourage the villagers to respect them.

7.10. Absence of protectionist barriers in the importing countries

On the other hand, protectionist barriers by the industrial countries to the import of gum arabic do not represent a limit on the development of trade in this commodity.. In all of the important importing countries of Europe, North America or Japan, there are no specific quotas or import duties raised on gum arabic imports. Some countries only require a certificate of origin, others, such as the USA also require a certificate specifying that the product is safe from a phyto-sanitary point of view. “Organic” gum arabic is subject to more rigid requirements to ensure that it is free of all chemical treatment.

The only important barrier to trade is the current embargo of the USA on imports from Sudan. However, in the case of gum arabic, there is a system of import licensing in place which enables trade in this product to escape the embargo. These import licences remain hard to get and trade has been somewhat discouraged as a result, sources of US imports have become more diversified. At any rate such an embargo would be difficult to implement. Consider the case of an European processor who imports gum from the Sudan, mixes it with gum from West Africa or Chad, spray dries it and then re-exports the final product to the United States as a product “Made in France”. Such a product nevertheless contains between 50 and 100% Sudanese gum.

8. Demand and markets

Gum arabic has remarkable characteristics that make it a most sought after product on the world market. The combination of its molecular and chemical characteristics give it excellent properties as a soluble agent in water, with a low viscosity. Gum arabic thus possesses essential properties such as those of an emulsifier, a stabiliser, a thickener and a suspending agent. It has no sugar content and contributes very few calories.

8.1. Estimate of current and potential market size

One can estimate the current total market for gum arabic at around 50 \$US million. This is based on a volume of 50.000 metric tonnes of exports at an average price of 1.000 \$US/per tonne. It has also been estimated by industry sources¹¹ that the market for gum arabic is on the increase. This estimate is based on the assumption of the continuation of the low price of this product on the world market and its sustained competitive position vis à vis its major substitutes. The market is projected to grow at an annual rate of 5% and could reach a level of 90.000 tonnes by the year 2010. This increase, if it actually happens, would open up market prospects for African producing countries, both those currently active in this market and various newcomers.

8.2. Main uses of gum arabic

There is no recent study available on the various uses of gum arabic, the last such study that we know of dates from the early 1980s and is out of date. We shall simply recall the main uses mentioned in the literature.

The industrial sector of the rich countries in the Northern Hemisphere finds many uses for gum arabic. It is useful to class these into three different sectors :

Food and beverage sector : one of the most important applications. Gum arabic is used as a food additive in confectionery, pastries and wine. It is used in the encapsulation of flavours or in "dragéification" (coating agent in sweets). It is the recognised preferred natural ingredient of high-quality soft candies. It is used as a stabiliser and emulsifying agent in fizzy and other drinks and as a clarifying agent in the production of wine. More recently it has found a wide range of applications in the health foods or dietary foods sub-sector. Confectionery remains the major market for gum arabic although this market has declined in recent years on account of the variation in qualities received and in the price. However, gelatine, the major direct competitor of gum arabic in this sector, has recently suffered from the mad cow crisis and could be excluded from confectionery uses under the pressure from consumers.

Pharmaceutical or para-pharmaceutical industry. It is used as an ingredient in cough pastilles, as a filling agent or in the encapsulation of pills or capsules. In cough mixtures, it is used as an emulsifier or a suspending agent. Gum arabic may be used in cosmetic products such as face masks, hair creams, protective creams and lotions.

Various other sectors. The ability of gum arabic to form highly uniform films and to carry numerous ingredients through co-spray-drying, has made it a recognised option in sprayed glazes. It is used as an additive in the production of lithographic inks (it's ability to form excellent films make it suitable for the treatment of photosensitive plates).It finds uses in the paint and textile printing industries, in the hardening of moulds in foundry ceramics, in glues and polymers, explosives, photographic emulsions, pesticides

¹¹ By the CNI Company, Rouen, France, the main French importer of gum arabic.

8.3. A selection of food products that use gum arabic

The following represent a selection of contemporary food products that uses gum arabic as an ingredient.

Herbal gold : made from fibregum, a totally natural extract of the acacia tree, giving high levels of soluble dietary fibre, an essential cornerstone of healthy eating

La Vosgienne : A totally acacia gum-based product in the form of pastilles used for combating coughs. Gum acacia is sugar-free and calorie free, rich in fibre and used for these qualities in this classical application

Nesvital (Nestle) : a dietary foodstuff made from concentrated wheat, dehydrated apple and other ingredients. Uses gum arabic as a binding agent.

Taillefine (Danone Group) : Cereal bars using gum arabic as a thickening agent

Contrex Ligne et Tonus – A natural high vitamin content health drink that uses gum arabic as a source of dietary fibre.

Slim Fast : a fat free milk-based slimming product that uses gum arabic as a non-calorific natural fibre source

Pepsi and Cocoa Cola : Use gum arabic as an emulsifying agent in their drinks preparations.

8.4. A recent development – as a source of dietary fibre

Recent studies have given evidence of the usefulness of gum arabic in the digestive process. Present day diets are in general poor in fibre content and transit through the intestine needs a minimum amount of natural fibre. Gum arabic encourages the stabilisation of intestinal flore and enables an efficient intestinal transit to occur. This contributes in the fight against certain diseases, such as colon cancer. Thus acacia gum appears to be a promising new fibre source with highly suitable nutritional properties.

8.5. Comparative uses of acacia senegal (hard) gum and acacia seyal (flaky) gum

In the food industry, Acacia senegal hard gum is used primarily as an emulsifying agent. Acacia seyal flaky gum is used as a dietary fibre and as a coating agent. Acacia seyal gum can also be used as an emulsifying agent, in the manufacture of stabilised aromas in a drink product (Tang). Both types of gum are used as encapsulating agents, as protective agents for aromas, a jelly agent, a thickener.

8.6. Importers of gum arabic

These importers are established in the industrial countries of the Northern Hemisphere as well as in India. Two-thirds of world imports are destined for Europe.

We can distinguish two different types of importers :

- those that import for further transformation and re-sale of the processed product as an intermediate good, i.e; a good that enters into the production process of another industry
- those that import gum arabic in an already processed form and incorporate this product into a final product

Virtually all raw gum arabic that is imported into the industrial countries undergoes the complete industrial process which transforms it first into a spray dried product which is then either sold or is processed into various specialised products for sale to different clients, either on the local market or as an export.

In this first category of importer, one can distinguish two different sub-categories – those that possess their own spray-drying equipment and those that do not, but sub-contract this process out to a local company that does possess such equipment (a spray-drying tower, of the same kind that is used for the production of powdered milk).

In the first category, are companies such as CNI (Colloides Naturelles Internationales) which possesses at Rouen in France a factory which has the biggest capacity in the world for spray drying of gum arabic (15 to 18.000 tonnes of annual capacity). At the other end of the scale, are a number of smaller importers, such as ALLAND et ROBERT or VALMAR, which import a few hundred tonnes of gum arabic and which have it spray dried on a sub-contracting basis.

The second category of importer includes all the large confectionery and drink manufacturers, such as Coca Cola, Pepsi Cola, Mars, Nestle-Rowntrees, Danone to mention only the main ones. They integrate the spray-dried gum arabic directly into their production processes for finished sweets, foods and drinks.

8.7. Imports by country

The following table, taken from Muller (2000), gives the breakdown of raw gum arabic imports by major importing country for the years 1991-98. In this table, India's declared imports of "raw gum arabic" have been reduced by a third to take into account the inclusion of lower grade products or other types of gum in their statistics.

Imports of gum arabic by country, 1991-1998
In metric tonnes

	France	U.K.	Germany	Italy	USA	Japan	India	Others	Total
1991	9.781	6.810	3.251	3.451	5.479	1.983	3.311	2.998	37.064
1992	9.691	7.402	4.114	1.095	2.681	1.682	2.668	2.570	31.903
1993	10.560	4.724	2.957	2.058	2.035	782	2.573	1.746	27.435
1994	12.009	4.653	4.371	5.201	6.916	1.447	3.763	3.362	41.722
1995	10.675	4.247	4.518	2.169	5.364	1.072	7.547	2.740	38.332
1996	12.450	4.079	2.528	1.735	6.454	1.220	8.334	3.987	40.787
1997	15.931	4.836	3.252	699	6.078	1.379	6.095	3.371	41.641
1998	20.075	5.137	3.058	644	9.028	1.599	N. Av.	4.081	43.622
Average 1991-1997	11.585	5.250	3.570	2.344	5.001	1.366	4.899	2.967	36.982

This table shows that the market turned around first in 1994, then more obviously in 1996. It attained a level of 44.000 tonnes in 1998, excluding India's imports. This turn-around mirrors the decline in prices on the world market (see graph 2 above).

The previous table indicates that the majority of raw gum arabic imports over the period 1991-97 were to countries of the EU. The four major importing countries of the EU shown accounted for over 60% of total imports during the period covered, with France the leading importer (almost a third of the total). The US market for raw gum arabic has also expanded rapidly in the recent period, increasing from 2000 tonnes in 1993 to 9.000 tonnes in 1998.

8.8 Competitive substitutes for gum arabic – gelatine and starches

Gum arabic faces competition from two major alternative products : starches and gelatine. Starches are obtained mainly from maize or corn or potatoes, sources which are far more easily controllable on an industrial scale compared to gum arabic.

Starches are used in the non-food industry, in paper manufacture, textiles, carpets, adhesives, ceramics, inks and in the food industry, in the production of baby foods, biscuits, emulsifiers, confectionery, salad sauces, soups. All these applications are common to gum arabic as well.

The other advantage that starches has is the possibility that they can be modified chemically, by etherification, esterification or oxidation. These modifications give them some technological advantages compared with gum arabic. In face of this competition, gum arabic is perhaps more rustic but remains in its natural state more generally applicable.

Gelatine produced by an acid-based reduction process of pig or beef carcasses has been used in certain new types of confectionery, but also in combination with starches, gelatine has replaced gum arabic in the confectionery industry in general where gum arabic's overall share has dropped from 60 to 40%. Gelatine is also available all the year round, with no problems of availability. It is always in excess supply, as it is a by-product of a waste product (carcass)..

Gum arabic has lost markets to its competitors in the area of jellied confectionery and lower quality drinks taken from automatic delivery machines In the face of competition from these two substitutes, gum arabic can bet on its major trump card which is its 100% natural quality, free from any type of chemical or genetic modification. To ensure it stays ahead, however, gum arabic must be available all the year round (through the constitution of buffer stocks). Currently, gum arabic has a price advantage over some of its major competitives, as can be seen from the following table. But its margin is limited and there is little room for any increase in the near future.

1. Gum arabic based product	2. Modified starch based substitute	Price ratio (1/2)
Coatingum	Cristalgum	1/1,1
Spraygum	Purity	1/1,2
Spraygum	Capsul	1/1,5

In fact, the price of gum arabic should if possible be reduced in the future to ensure it maintains its markets and eventually recovers markets lost previously to substitutes. One way to achieve such a reduction is to eliminate the middlemen involved in its marketing.

8.9. Conclusions on the world demand for gum arabic

It would appear, from what has been said, that the future market of gum arabic is relatively well assured. This product has a natural advantage over its competitive substitutes in a wide range of applications which will keep it in demand in the future. Just how rapidly the market for gum arabic will expand is however a difficult question to answer, given the information that is available. The current estimates of a 5% per annum increase are based on the assumption that the current relative price of gum arabic remains at its present level and therefore gum arabic retains its advantage over its starch and gelatine based substitutes in a wide range of applications and that these applications are going to increase. Its recent inroad into the health foods segment of the market is another positive aspect of the recent experience in this market.

Altogether, the assumption of a 5% increase annually does not appear unreasonable.

9. Implications for future assistance

Future assistance to this sector has to be carefully designed, given its relatively undeveloped state at the current time and the essentially primitive methods used for its production/collection and initial marketing.

The following are a few ideas on possible domains of future assistance.

9.1. Information

A first effort should be directed at encouraging the villages in the gum belt to plant *Acacia senegal* trees. The current shortage of supply of gum arabic has been brought up in the context of Nigeria, but also applies to Chad and the other smaller producing countries of the gum belt.

In order that the villagers plant *Acacia senegal* trees they must be informed of the various advantages that they can derive from such an activity. These advantages are not only economic – a supplementary source of income during the dry season – but also environmental – assistance in the fight against desertification. The information disseminated could include a relatively simple approach to the world market for gum arabic, the costs of planting, the income to be gained from the sales of gum arabic, the importance of different grades in determining the final price.

A well devised information campaign, using all the media available – press, radio and special local language publications – aimed at the ordinary villager or village authority, could encourage them to undertake the necessary effort and plant *Acacia* trees on the lands under the village authority. This encouragement could extend to State or Local Authorities with land available for undertaking more extensive plantations on publicly owned or controlled land.

A second target for new information is the extension worker or the trainer whose job it is to encourage the villager to undertake new planting and to collect more gum arabic. In this respect, there is a general need for practical manuals on gum production to be made available to these extension workers. Such a manual has been prepared already and ought to be published soon by the FAO with the assistance of different private associations. There is no reason why several different manuals should not be produced and distributed to interested persons.

In those regions where gum is available, but is not being collected, different measures have to be devised to encourage the collectors to enter these zones and to undertake the necessary tapping and collecting activities. In this respect, the creation of wells and pumps may be something to recommend, if these can be properly managed by the local people, which may be difficult in isolated new zones of production.

A programme of assistance to the seasonal collectors to enable them to finance their food and other basic necessities during the dry season could be suggested. This assistance, in the form of a short term credit could be given to the local merchant on the basis of guaranteed purchase contracts for the gum, with the collector. In this way, the latter will be encouraged to enter the new zone and collect the gum.

9.2. Training

Training is the next area suggested for possible future assistance. Various efforts in the past have gone into the creation of a gum training centre, without the success that this idea merits. The creation of such a centre, based on the presence of gum acacia trees that can be ideally managed and tapped as part of the training to be received, would go some way to improving the supply of gum arabic to the

market. The centre would aim at training extension workers involved in the field of gum arabic; there could be one for a French speaking country, another in an English speaking country, and the trainees could be taken in from the countries of the surrounding region.

Such training could also be carried out on a national level. The Nigerian gum arabic development project, for example, foresees the holding of state-level training workshops emphasising the means to increase supply. Training sessions will be devoted to topics such as improved harvesting methods, proper treatment of trees, sessions on agro-forestry, quality control, sorting and grading and product traceability. These are issues of general concern to all producing countries and they can adopt a similar approach in developing their training programmes.

9.3. The production of improved planting material and the creation of nurseries.

In those areas where the production of gum arabic is already developed, or even in order to help in the establishment of new zones of production, an effort in the field of the improvement of planting material is required. This effort will involve the creation of seed banks and nurseries to encourage the multiplication of selected seeds and plants in preparation for their use in the village level plantations or in the more extensive publicly owned plantations. A programme of assistance under the supervision of local NGOs could be directed at the District level to enable such nurseries and seed banks to be created and the extension of their output ensured.

9.4. A tree subsidy

It has been suggested in the literature to offer a subsidy to the individual planter of acacia trees in order to encourage him to maintain his trees for the growing period, right up until they can be tapped and cropped. These subsidies would apply in the case of the development of “gum gardens”, i.e. pure strain plantations in specifically reserved zones, under the control of an individual or group of identified individuals.

Two versions of such a subsidy have been suggested, both involve a payment per tree maintained. First, a “tree maturity subsidy” to be paid when the tree reaches maturity, not soon after it is planted, as a means of ensuring that the trees receive proper care during the interim growing period of 3-7 years. A second version envisages the payment of an annual subsidy to ensure that the trees are continuously tended to and to guarantee that they reach maturity. The second version has the advantage of ensuring that the trees are looked year to year, whereas the first version, by paying only when the tree reaches maturity, runs the risk of being inadequate to encourage maintenance of the trees on an annual basis. However, some sort of subsidy appears to be necessary to ensure that the trees are protected from damage by animals and generally looked after during their early life before they can be tapped and cropped.

In order for such a subsidy to operate, the property rights over the different trees have to be clearly established, right from the beginning in order that the rewards are returned to the person that has invested the necessary effort in maintaining the trees. It is thus to be limited to village level plantations or plantations under the control of a given village.

9.5. Research

Research into improved strains of *Acacia Senegal* and *Acacia Seyal* should be encouraged in an attempt to increase both the quantity and quality of gum coming onto the market. Different programmes could be established, above all in the smaller producing countries, using the Sudanese experience as a model to be adapted. The establishment of experimental plantations using improved strains of *Acacia* trees could represent one element of such programmes.

9.6. Assistance in the marketing of gum arabic

In many areas of Chad, for instance, there are gum bearing Acacia trees which are not being exploited because of the lack of marketing facilities. No local merchant is willing to buy the gum and to resell it to a wholesaler in the nearest town and there is no agent who passes in the region to buy up the available gum. Under these circumstances, the gum goes uncollected and a source of income is lost.

If the gum collectors could be encouraged to form associations then such associations could attract finance for the construction of suitable hangars or stores and the purchase of scales to weigh the gum arabic. The stored gum could then be bulked up and transported collectively to the local town and sold to the wholesaler.

9.7. Rural roads

All this effort to promote the production and collection of gum arabic will be of no good unless access to the market can be guaranteed. This is difficult in isolated areas where the network of roads and tracks is virtually non-existent, as is the case of areas that produce gum arabic. Efforts will have to be made in respect of opening new roads in areas that are currently locked in isolation from the market place, and to maintain roads or tracks that exist but that are impassable at different times of the year. The establishment of an efficient road network will not only encourage trade in gum arabic, but in other commodities as well and can contribute to raising the general level of welfare of rural people who are currently deprived of such infrastructure.

9.8. The role of producers associations

As has been seen, producers associations are only found in the Sudan and Chad at the current time. There is no reference to them in the literature on the other countries of the gum belt. That is not to say that such associations could not play an important role in the future development of gum arabic, along the lines suggested above. In particular they could contribute to future development projects through :

- the creation of nurseries and the distribution of plants to their members
- the purchase of tapping tools that can be rented out to their members
- the provision of information to their members – on market trends by type of gum, prices, grading and related issues
- the provision of collectively owned stores and weighing scales and the transport of the gum to a local market
- the organisation of training sessions for members on all aspects of gum arabic production and collection

There is a need for more work to be done on this aspect in order (i) to be better informed of current initiatives in this field and (ii) to refine the various roles that these associations could play in the development of gum arabic production. Only then will it be possible to make useful recommendations as to the improvements needed in this aspect of the institutional environment.

10 Proposals for specific sub-regional and country level strategies

10.1. Introduction

Our on-the-ground mission had a its purpose (i) to follow up on the main report with a view to completing the information it contained and (ii) to develop proposals for possible future Bank assistance to this sector.

We have considered the situation and have decided to propose an approach at two different levels : (i) the sub-regional level where a proposal is made for the implementation of a project for the creation of a sub-regional seed bank and (ii) at the country level for each of the three countries visited – Chad, Mali and Niger. Whilst the problems that these countries are facing are similar in all three cases, there are sufficient variations in the state of development of the gum arabic sector to justify a slightly different approach in each of the three countries.

10.2. Sub-regional level – seed bank and multiplication programme

The three countries visited all suffer from constraints relative to their geographical environment (land-locked status) which have repercussions on the technical options to be put into place for the production of gum arabic. The systematic use of acacias for reforestation programmes and other support programmes for producers is to be noted.

As a result, we recommend that a development programme be implemented, on a sub-regional scale for the improvement of gum arabic production. This programme would cover the following aspects :

- a seed improvement component by a programme of collection of selected seeds from trees that have been duly identified as good gum producers and taken from the different countries of the sub-region. The different national sources are necessary in order to avoid the risk of having a single eco-type available.
- Setting up of a programme of vegetative multiplication of this parent stock (by micro-propagation and propagation by the planting of small cuttings)
- The production of trees by a grafting process
- The seeding of young plants in nurseries with the use of Acacia rhizobiums in order to ensure a better take up when replanted in the field.¹²

These programmes can be backed up by a training programme for producers in methods of tapping by chosen specialists as well as training in the area of the search for improved quality, for instance in educating the producers in the right techniques of cleaning the *acacia senegal* gum collected before bagging or sale. The second quality, from the *acacia seyal*, could be separated into two different colour categories, one white the other yellow-dark orange. The white coloured variety could gain a premium on the market on account of its being more easily discoloured.

The programme could be co-ordinated by a sub-regional bureau that would cover all the different gum producing countries of the sub-region (Senegal, Mauritania, Mali, Niger, Burkina Faso, Chad, Cameroon). It would centralise the management of the different sub-regional programmes as well as collecting all the relevant documentation.

10.3. Chad

¹² It should be noted that these last three proposals have already been applied in the context of a thesis at the University of Marseilles during the period 1983-89 by a Malian forestry student (Abraham N'diaye, IER, Bamako and a Senegalese one Simon Badji, Senegalese Forestry and Water Department).

10.3.1 Previous assistance efforts

Chad has already received a certain amount of assistance for its gum arabic sector, from the EU, FAO and, more recently AFD (terminating in 2001). This latter project was notable for its efforts in the area of resource mapping and its has developed extensive knowledge of the geographical distribution of acacia gum trees and their natural regeneration over large areas of the country. It did not however contribute much to promoting the welfare of the gum producers themselves as it had set out to do. The only efforts in this direction have been undertaken by a local NGO, DARNA, which has financed various programmes of assistance at the village level since 1987. It carried out training programmes in all areas from seeds to techniques of gum production in various villages (Tourba, Dourbali). It also financed a sort of mini-stabilisation fund for 4 local selling points (500.000 FCFA/selling point). This fund paid the difference between an average selling price for the season and the daily selling price. It aimed at the stabilisation of the producer price throughout the season. This NGO still has an active interest in the promotion of the gum arabic sector in Chad but has not received any financial support for continuing its efforts during recent years.

The World Bank is at the moment financing a support project aimed at increasing the level of agricultural production (Projet d'appui aux services agricoles et aux organisations de producteurs - PSAOP) under which initiatives in the gum arabic sector can be admitted. These projects have to be presented by the interested parties themselves and are subject to the requirement of a 20% contribution to the costs of the project by the promoters themselves.

10.3.2. Proposed strategy

The strategy that is proposed for Chad is a three-pronged one. It is proposed to support the promotion of gum arabic production through (i) a support package for existing producer groups (ii) the creation of a small number of village level plantations of 20 hectares in size and (iii) the financing of an entrepôt for use by the exporters in each of their two ports of embarkation (Douala and Lagos) of gum sold

10.3.3. Support package for producer groups

The creation of producer groups should be encouraged throughout the gum belt. In the case, frequently observed, of existing producer groups a support package can be recommended. This package would consist of the following activities :

Pursuit of the previous training programme implemented by DARNA. This training programme can be targeted on 4-5 villages and can cover all aspects of gum production from the preparation of nurseries to the tapping, collection, sorting and bagging of the gum.

Introduction, on an experimental basis at first, of a seasonal credit system for groups of gum producers. This is a crucial element and is justified by the necessity to keep the villagers free from the middlemen currently responsible for the provision of on-the-spot credit and the subsequent payment of low prices for the gum sold in return by the producer. This proposed credit system could operate through the creation of a local savings and trading bank (caisse villageoise) which would receive the contributions of the village gum producers and also a line of credit from the supervising NGO. The caisse could be used by the villagers in times of difficulty in return for a guarantee to sell to the caisse an equivalent amount of gum. The caisse could pre-finance the purchase of the group's gum, store it and sell it later in the season.

Development of village-level nurseries. Using the selected seeds from the sub-regional centre proposed above or from high yielding trees in the neighbourhood, nurseries would be developed in the selected villages. It has been recommended that the se nurseries be established by private, professional

nurserymen who would sell the plants to the villagers. A loan of 500.000 FCFA would suffice to enable such a person to become established. Another suggestion is to undertake the creation of these nurseries in association with the local Forestry Service and to keep the costs to a minimum through the use of this service's resources. We would prefer the first option.

Provision of spraying equipment and natural biological pesticides to the selected village groups. In Chad, the gum trees are often the subject of attacks from locusts (criquets) who destroy the leaves and prevent the tree from producing its gum. It is essential that the villagers have available a minimum amount of spraying equipment and pesticides to be used in the case of an attack by locusts. These should be biological pesticides so as to ensure that the gum from the villages involved can still qualify as an organic, natural chemical-free product when being sold on the world market (accreditation for qualifying under this status costs about 7.500 €per year).

Construction of wells or bore-holes. The lack of water has already been emphasised as an important factor limiting the collection and production of gum arabic in countries such as Chad. The wells or bore-holes that are to be sunk will have to be partly financed by the villagers concerned. They would be constructed within a radius of say 10 kilometres from the nearest village, at some distance from itinerant cattle tracks (couloirs de transhumance). They would be under the responsibility of the nearest village which would manage the well and control its use –limited to gum producers in general.

Equipment for fighting bush fires. In the region of Dourbali, for example, the frequency of bush fires is considerable and this represents another constraint on the production of gum arabic. It is suggested that the villages be provided with elementary fire-fighting equipment produced by local blacksmiths (such as simple beating tools) in order for them to be able to counter recurrent bush fires.

This support package can first be experimented on a limited number of villages and if it proves successful, its generalisation may be envisaged for the country as a whole. Beneficiaries may be prepared to contribute to the overall cost of the package.

10.3.4. Creation of village level plantations

It is proposed that plantations be established in a few selected villages under the initiative of the villagers themselves, in the region of Dourbali for example. This is an important gum producing region of Chad where trees are known to produce up to 4 kgs of gum every four weeks from December to March. This is therefore an element of the national "patrimony" which it is vital to preserve. In this zone the producers do not take the precaution of replanting a young tree next to its parent and the latter have now been in place for more than 15 years and are at the end of their productive lives. There is little time left to replace them.

The proposed blocks would be 20 hectares in size, using land provided by the village. They would be planted using the selected material provided by the locally established nursery. They would be fenced-in, using rolls of barbed wire that are mobile and can be displaced after the trees reach a certain height (after two years). The barbed wire fence would be backed up by a live hedge planted behind it to ensure complete protection. It would be equipped with a well/bore-hole which can also be used by the villagers who could undertake market gardening or other agro-forestry activities on a part of the block reserved for this purpose. There could also be a hard floored store equipped with weighing scales to assist in the marketing of the gum produced, both on the villagers own plots and on the village block. The block would also be equipped with watering cans, carts and spraying equipment against locusts. It would be placed under the permanent supervision of an officer from the local Forestry Service.

The villagers would provide the labour for planting the trees, but to overcome the difficulty of finding sufficient labour at the right time (trees have to be planted after the start of the rainy season which is the busiest time of the year), the block can be developed in portions of 5 hectares per year. This would

save on the amount of time spent on planting and also economise on the use of the barbed wire fencing (a costly item) which could be transferred from one portion of the block to another developed later.

The planned block would provide a demonstration effect and an encouragement for villagers to develop production of gum on their own plantations or in the areas of natural stands in the neighbourhood. They would be motivated to participate in the creation of these blocks on account of (i) their use of the resources of the block – the water, for example, for cultivating food crops or market gardens (ii) their revenues gained from the gum produced by the block.

At the same time as the level of production is increased, the producer groups will become more consolidated. They can then be encouraged to enter into sales contracts with an exporter and to use these contracts as a means of gaining access to seasonal credit.

The contribution of the villagers for the promotion of this project for possible submission to the PSAOP can come from different sources (i) supply of land and labour for planting, creation of live hedges, weeding and well construction (ii) material for planting, well construction and (iii) eventually a financial contribution towards the establishment of these blocks. They could, in return, receive a tree subsidy at the end of each season during which the proper maintenance of the block has been assured..

10.3.5. The area of Am Imam

A special support programme for the villages in the Am Imam region would appear to be required. This is the main producing region for flaky gum. But it is a very isolated area in which the roads are bad not to say non-existent. There are in this region large areas under natural stands of acacia seyal trees, but they remain inaccessible on account of the lack of a suitable supply of water. A well construction programme could be envisaged for this area, with, as an additional component, the creation of a regional storage and weighing centre for flaky gum.

10.3.6. Creation of an entrepôt at Lagos and Douala

Whereas the previous elements of the proposed strategy aim at direct support for the producer, this third element has as its targeted beneficiaries the exporters themselves. There are about ten of the se, each with his own selling strategy and approach to the world market – some are exclusive agents, others are partners in overseas firms, others are independent sellers, some use Lagos others use Douala for evacuating their gum, some have a quality control laboratory, others don't see the need for such a tool.

Despite these differences, there is a case for proposing the creation of an entrepôt at Douala and Lagos. This entrepôt would store individual buffer stocks of gum to be financed by each exporter, but would enable each of these exporters to respond quickly to overseas orders throughout the year.

The entrepôt would be equipped with a fork lift and weighing scales, would cover an area of around 1000m² and have zones reserved for each exporter.

As an option, the installation of a quality control laboratory in each store could be recommended. This laboratory could carry out quality control tests on lots destined for export from the port and could avoid the problem of the mixing of lots currently suffered by at least one exporter undertaking quality control for his exports (the lots arrive at their destination but they often do not correspond to the lots for which the quality controls have been undertaken). This option is however unlikely to be favoured by all exporters.

This entrepôt proposal could be backed by a credit scheme in favour of the exporters. A line of credit at a reduced interest rate could be made available to the exporters enabling them to finance their

purchases of gum arabic. Or a guarantee scheme could be envisaged using the buffer stock as the guarantee to be provided by the different exporters. This credit could be made available at a reduced rate, relative to current interest rates charged by local banks (around 15% per annum) and could enable a higher price to be paid to the producer.

The entrepôts would each be managed by a forwarding agent (transitaire), under the responsibility of the Exporters Association of Chad. Exporters would pay for the use of the stores on a pro rata basis and cover the amortisation cost of the loan. Their operations would be self-financed and they could eventually make profits for the Association.

10.3.7. Support for private investment

As regards the quality of its gum, Chad benefits from a good reputation and can depend on a group of professional exporters. A certain number of these are already equipped with mechanised sorting and calibrating equipment, crushing machines and a quality control laboratory. Further investment could be financed for the acquisition of a turbo-drier in order to improve the quality of the powder that can be produced by this method. The ultimate stage which would consist of the construction of a spray drying tower used to refine the gum locally in order to produce a pasteurised product, is still a certain way in the future. The suffocating weight of the local bureaucracy and the difficulty of being able to benefit from a reliable supply of energy make any proposal in this direction premature.

10.3.8. Proposed calendar

01/03-04/03 - Selection of 5-10 villages for the support programme and the proposed plantations
- Identification of productive source trees in the region of Dourbali
- Discussion with the villagers on the siting of the village level blocks

05/03 – 07/03
- Implementation of a first phase of the support programme for selected villages
- Fencing in of selected blocks, setting up of nurseries, well construction and establishment of market gardening activities or growing of food crops

07/03 – 08/03
- Implementation of a second phase of the support programme for selected villages
- Planting of the young acacia trees and establishment of a live hedge around the blocks
- Construction of small stores on the blocks

10/03
- Cutting of grass and establishment of fire protection belt around the blocks

11/03 – 05/04
- Collection of gum from the natural stands around the blocks. Stocking in the block store

Repeat of the programme during the years 2004-2006 with an extension of the areas under food crops or market gardens.

2007
- First harvest of gum from the first 5 hectare block

10.4. Mali

10.4.1. Introduction

The gum sector in Mali suffers from a state of under-development and a backwardness of techniques used (tapping in particular is relatively unheard of outside the region of Kayes). Production is limited, well below its potential and outside the region of Kayes where a regional trade in gum is still active, in the rest of the country the sector is in a state of chronic underdevelopment. In all regions other than Kayes, collection is done on natural stands, as a result of journeys over long distances for smallish amounts of gum collected. Villages are isolated from the main towns, banks and roads are non-existent and tracks are not passable in the rainy season. There are no village plantations, no planting of young trees or re-afforestation on a large scale using acacia, many areas suffer from increasing desertification however. Producers are not grouped into associations and are therefore vulnerable to being exploited by unscrupulous middlemen. There are too many of these middlemen engaged in the gum trade, but only one major exporter of Malian gum overseas.

The World Bank has financed since 1996 a support project for the valorisation and marketing of agricultural products, in particular in the support of the development of 7 different products that have export potential (mangoes, potatoes, onions, shallots, tomatoes, karite and gum arabic). It has, through the promotion agency, APROFA, jointly financed a training programme in gum tapping techniques to be undertaken in the month of October 2002 in two separate regions (Dioura and Cinzana). The local private entrepreneur who is the major exporter of gum arabic from the country, has also contributed financially to the running of these training programmes. This project is finishing shortly, another follow-up project is expected.

Unlike the case of Chad, the situation in Mali is currently characterised by an absence of major traders and a producer sector that is based on the natural collection/gathering mode by individuals or nomads. Given the low price on the world market which is likely to last for many years, the elimination of middlemen is essential in order for producer prices to be raised and production encouraged. This is one of the major directions chosen for the support strategy outlined in the following section.

10.4.2. A four pronged support strategy

The support strategy suggested for Mali is in four directions (i) a programme of information and training with a view to encouraging the producers in the production of gum arabic and the promotion of high quality gum for sale on the world market (ii) the establishment of village level plantations of 20 hectares around which the villagers will be encouraged to plant gum trees on their own plots of land (iii) a programme of animation aimed at the creation of producer groups and their subsequent federation into a national union of gum producers that can take on important functions in gum marketing and credit provision and, lastly (iv) the creation of a block of 500 hectares. On an industrial scale, in the region of Bamako.

An information and training programme. Aimed at encouraging the increased production of gum arabic, an information programme can be introduced using the rural radio system. This would broadcast information on the world market for of gum arabic, its current price and the international and local transport costs incurred in order to reach the export market. The information for these broadcasts could be prepared by an internationally-based NGO and relayed by the Malian Office of Telecommunications. They would be aimed at villages interested in developing the production and marketing of gum arabic.

Another element of this information programme would be the creation of an Export Charter for Malian gum. This is necessary in order to overcome the reticence of overseas importers who still have in mind the poor quality of Malian gum exported in the past

Training programmes and the search for quality. One of the very first operations to be organised would be the training of the producers in tapping methods, as well as techniques in the cleaning of the best quality gum, right from the collection stage. Training in the separation of hard and flaky gum (“first and second quality”) into two colours (clear and dark) would be undertaken.

Establishment of 20 hectare village plantations in two different types of environment (Bambara Maounde and Dioura for instance). These would be conceived along the exactly the same lines as those recommended in the case of Chad (fenced with a nursery, well/bore hole, minimum equipment, work force provided by the village...) and would be established on 6 sites of 20 hectares. In the Malian case however a slight variation is envisaged. This is that these village level plantations would act as a stimulus for the creation of private plots of gum trees in the environs. These plots do not exist at the moment and would have to be created as a result of the project, but the basic idea is that the blocks would encourage their development and thereby the production of gum arabic in the future.

This component aims at the demonstration of techniques of gum production through the village level block, the encouragement of the production of gum in the surrounding areas and the re-planting of deforested areas subject to desertification.

Animation with a view to the creation of producers groups. The basic idea is to place an animator in each chosen village, equipped with a motorcycle. His job would be to persuade the villagers to join into groups for the collective marketing of their gum. These animators could be modelled on those that are currently in the villages, financed by the PAIB (Projet d’Appui aux Initiatives de Base).

The next phase would be the federation of the village level groups into a regional level federation and then into an apex level organisation at the national level. This apex organisation would develop several important functions.

First it would market the gum arabic on behalf of its members, selling it to the local exporters in Bamako. It would seek to sell a maximum amount of its members production, but would not need to have a monopoly of the marketing of the country’s gum. Using its projected sales as a guarantee, it could take on credit for distribution to its members. This credit would be recovered by the apex organisation when it finally sells the gum. The system could be modelled on that devised for the marketing of cereals in the Dogon area of Mali, under the Projet d’Appui à la Commercialisation Collective des Céréales du Mali (PACCEM), financed by Canada¹³. Under this project, the cereals are marketed by the apex organisation which recovers the credit. The credit to the arabic gum apex could be partly guaranteed by the sales contracts of gum arabic that the producer groups will sign with the apex organisation, or that the apex organisation signs with the exporter. The other part of the risk could be supported by the lending bank.

The apex organisation would fix the annual buying price of gum arabic for its members throughout the country. It would also have a store, a bureau in Bamako and lorry or lorries for the collection of gum from the regions or villages. It would also sort, store and bag for export. It could also eventually run a quality control laboratory for testing of gum samples on behalf of the different exporters.

A 500 hectare block. A block of 500 hectares would be established within a radius of 100 kms from Bamako on the road to Segou either next to a reserved forest area (“forêt classée”) or inside a forest reserve, again associating the surrounding villages in its operational management. This block to be established over a period of 4 years at a rate of 100 hectares per year would be copied on the village block model but would use heavy equipment (tractors, motorised pumping equipment etc.) which would be owned by the block but put at the disposal of the villagers who wish to cultivate food crops or undertake market gardening on a large scale under technical supervision.

¹³ This point merits more detailed attention to appraise its feasibility

This block would be used also for testing and developing different varieties of *cyamopsis tetragonoloba* or guar, a leguminous plant of African origin but which is widely cultivated in the USA and India. This plant is well adapted to dry region conditions and its average yield is 1tonnes/ha in seed. These seeds are then crushed to produce a guar flour, a thickening polysaccharide, used in the food industry. Its current consumption is 300.000 tonnes at an average price of 1,14€/kg c.i.f. European port. These seeds could be purchased from the producer at a price of around 60 FCFA/kg, giving a revenue per hectare of 114.000 FCFA.

10.4.3. Phasing

The following table gives an outline of the three phases of the proposed project and an indication of the activities to be carried out during each of these phases.

PHASE	ACTIVITIES
Phase I	Choice of two different regions for carrying out the first experimental phase, choice of sites for the village blocks and the 500 ha block
Year 1	Assistance in the forming of producer groups in these regions
	Implementation of an information programme by the rural radio system
	Identification of productive trees to be used as parent stock, implementation of the fencing and nurseries of the blocks.
	Training in the area of quality improvement
	Development of a Quality Guarantee Charter, used for convincing overseas importers of the quality of Malian gum
Phase II	Creation of the apex organisation – National Union of Gum Producers
Years 2 and 3	Establishing of a system of sales contracts with the local producer groups
	Establishment of a credit system through the apex organisation
	Establishment of the first 100ha of the industrial block
	Establishment of 20 hectare blocks in the two zones, over a period of four years per block
Phase III	Development and evolution of the activities of the apex organisation – logistical support for producers, establishment of a web site for monitoring the world market, establishment of a quality control laboratory
Years 4 to 5	Pursuit of the establishment of village level blocks and the 500 ha block
	Choice of two other regions
	Repeat of the initial development phase in these new regions
	Etc...

10.4.4 He private sector exporters have a long way to catch up with their Chadian counterparts in their methods of cleaning and calibrating their gum. A cleaning and sorting line could be installed at Segou for treating the gum from the Eastern region and another, later on at Kayes for the Western region. These treatment centres would not be automated and would continue to employ local labour. This labour would however, instead of being seated on the ground, would be seated on stools in front of a belt that moves at a low speed and directs the gum into specified lines and ends up in different bags. Only the calibrating would be undertaken by a mechanised screening device.

At a later stage, one could envisage the installation of a kibbling/crushing line and, eventually, a drying tower to obtain a powdered form.

10.4.5. Implementation of the proposed strategy for Chad and Mali

In both cases, the proposed strategy would take the form of a project to be integrated into a World Bank financed support project to the agricultural sector and for which the Bank would ensure overall control and supervision.

Regarding the strategy proposed for assistance to the production (as opposed to the marketing for export) of gum arabic, in both the case of Chad and Mali the project could be implemented using an internationally reputed NGO present in both countries (CARE for example). This international NGO would associate with a local NGO with previous experience of the gum arabic sector as a relay organisation (such as DARNA in Chad, or PROGOMME in Mali). These organisations would be responsible for supervising the implementation of all the proposed activities. These activities would be either undertaken directly by these NGOs (training and credit programmes in the Chad case for example) or sub-contracted out to the relevant local organisations specialised in the different areas to be covered (in Mali the ORTM for the rural radio, the forestry service for the plantations, the PAIB for the village level animation etc.).

10.5. Niger

10.5.1. Proposals

Niger has taken the lead in the establishment of private plantations (200 ha planted by ASI and 300 hectares by other individuals or co-operatives). It is necessary to activate a support programme for these planters who are grouped together under the Association of Gum Producers of Niger. A programme of tapping and identification of trees that have been planted would be started as from the month of December 2002, with the technical assistance of an expert-trainer to be paid for by the Association. This programme could be extended over the following year in order to put into place a detailed system for monitoring of gum production and tree marking/follow up in order to select the most productive trees for replanting. Other aspects such as improved pruning methods could also be covered.

An additional block of 500 ha could be established in association with the private sector and the Association of Gum Producers. It is to be noted that the FAO strategy proposes the creation of 200.000 ha by the year 2012.

A sorting/calibrating line could be installed at Diffa, in the Eastern part of the country in order to add a certain amount of value to the product and above all to stop it being exported to Maiduguri, Nigeria as is currently the case in general. A second such unit could be installed at Niamey to treat the gum from the rest of the country. In the longer run, a drying tower could be established at Maradi, but it should be noted that such a tower already exists at Kano, 900 kilometres from Niamey, and which could dry Niger's gum on a sub-contract basis.

10.5.2. Timing of proposed actions

The following is the proposed calendar of actions

01/03 – 05/03 training in the different zones of plantations in correct tapping and collection methods
localisation of a zone for the establishment of a 500 ha block
identification of good parent stock of productive trees

05/03 – 06/03 Fencing and creation of nurseries

07/03 Pursuit of assistance in the field of tree production monitoring/follow up

Plantation of 100 ha out of the 500 ha in total

09/03 – 10/03 Grass cutting and establishment of fire protection around the 500 ha block

11/03 – 05/04 Putting into production of the natural stands around the block

Repetition of the programme in 2004,2005 and 2006.

2007 Exploitation/collection of gum on the first 100 ha portion of the 500 ha block.

Conclusion

In Western Africa, it appears to be impossible to implement a successful rural development programme in the short term, i.e. in a period of five years or so. To be successful, a permanent presence in the villages appears to be necessary - for the supervision of the producer, for controlling the quality of the production, for paying the gum and evacuating it to the exporting centres. No sustainable development can take place in Africa if (i) the long term is not envisaged (10 year at least for a successful development programme) and (ii) the supervision or 'encadrement' and the organisation of the producers is not taken into account.

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